Municipal Engineering

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Town Scavenging and Refuse Disposal

By Hugh S. Watson, A. M. I. C. E., London, England

THE UTILIZATION OF RESIDUALS FROM REFUSE DESTRUCTORS.

SLAG Making at the Destructor Works of the Corporation of Kingston-on-Thames.—The clinker removed from the destructors is converted into paving slabs in the following manner. It is first ground up to the necessary size, and is then mixed in the proportions of 2½ bushels of granite chippings, 4½ bushels of screened clinker, and 2 bushels of Portland cement. The granite chippings and cement are gauged 4 to 1. The chippings and cement are first placed in the mold to a depth of one inch, and the mass is shaken about so as to cause the chippings to fall to the bottom, in order to give a good hard wearing surface. The rest of the mold is then filled with clinker and cement. One gauging, as given above, will make 32 feet super of 2-inch stone. The slabs are allowed to remain in the molds for one week, in order to set, at the end of which time they are taken out and stacked in the open for from three to six months to mature. The molds consist of wooden frames with a bottom of sheet zinc. Slabs of varying sizes are made, as also crossing blocks and gutter channels. By using granite chippings for the surface a very much more durable stone is produced, though, of course, the cost of production is increased. Mr. R. H. Clucas, the Borough Surveyor, estimates this to be from 2 shillings expense to 2 shillings 9 pence (60 to 66 cents) per square yard.

The Manufacture of Paving Blocks at the Destructor Works of the Royal Borough of Kensington.—At the destructor works of the Royal Borough of Kensington, an entirely new process has been adopted for the manufacture of paving blocks from the clinker residual and Trinidad Lake asphalt, with the addition of a small quantity of residuum petroleum. Experiments were made some years before the existing plant was put down. These were begun by Mr. W. Weaver, the late borough engineer of Kensington, and were continued by Mr. A. R. Finch, the present borough engineer. The clinker is removed from the furnaces in iron skips. It is fed while still hot into a grinding mill, having rollers over two tons in weight, by which it is broken up into fine particles. From the grinding mill the crushed clinker is conveyed by means of an elevator to a revolving steel dryer, on which it is heated to a temperature of 250 to 300 degrees F. The heated clinker then passes to the mixing mill, where the asphalt and residuum petroleum mixture is added. The asphalt is melted and maintained at a high temperature by the use of steam coils. When it has reached a suitable condition a small quantity of the residuum petroleum is added. The proportions used are 8 parts of clinker to 1 of asphalt by weight. When the clinker and asphalt have become thoroughly incorporated, the mixture is run into molds of the shape of an ordinary brick 9 inches by 4½ inches by 3 inches, and pressed in a machine which exerts a total pressure of approximately 90 tons on each block. From the pressing machine the blocks are passed into a cooling tank filled with water, through which they are carried on an endless conveyor. The blocks are black in color, and weigh about 9 lbs. each. They are laid after the manner of ordinary wood paving blocks, except that they are laid on their sides, instead of being placed on edge. They have been used on several streets under moderate traffic in the borough, and after upwards of two years trial are wearing well. The cost is stated to be about five shillings per square yard in place, but exact

figures as to cost are not available, owing to the plant still being for maintenance purposes in the hands of the constructors, Messrs. Goddard, Massy & Warner, of Nottingham.

Disposal of Flue Dust.—There are two methods, in common use, of disposing of the flue dust which is arrested in the dust catcher. The first of these is to mix it with some disinfectant and to employ it in disinfecting sanitary bins, or at the depots. The second is to use it as a fertilizer for grass or for lightening heavy soils. When used as a disinfecting powder the dust is usually mixed with carbolic acid in the proportions of 30 gallons of carbolic acid to every ton of dust.

Utilization of By-Products Recoverable from Refuse.—Having dealt with the utilization of the residuals from refuse destructors, there is still the question of the utilization of the by-products proceeding from the refuse itself to be considered. At most destructors the refuse is generally roughly screened before being put into the furnaces, and certain articles, such as bottles, tins and pieces of iron, etc., removed. The materials so recovered can be disposed of at a profit.

Tins and Scrap Iron.—There is a company known as the London Electron Works Co., Ltd., which purchases the tins recovered from the refuse of most of the Metropolitan Boroughs and towns within easy reach of London. This company treats the tins by an electro-chemical process to recover from them the solder and the pure tin. Briefly, the process is as follows: The tins are put into vats containing a chemical solution. An electric current is passed through the chemical and removes the whole of the solder and tin, which falls to the bottom of the vats, in the form of a thick sludge. The tins are then removed and pressed solid. The blocks thus made are despatched to iron or steel works for re-manufacture. The tin sludge is separated from the chemical solution and the solder removed. It is then partially dried and pressed into blocks which are sent to the tin smelting works for extraction. The prices realized at the different works vary very considerably. Thus, at the Metropolitan Borough of Fulham's works the tins and galvanized iron are sold together for 6 shillings and 7 pence per ton, while at Ealing tins alone realize 15 shillings per ton at the works; at Watford 16 shillings per ton on the rail, and at Kingston-on-Thames 17 shillings per ton. There is, of course, a certain amount of labor involved in separating the tins from the galvanized iron. Old iron fetches prices varying from one to five shillings per ton, the former price being paid at Ealing, and the latter at Kingston. The galvanized scrap collected at Watford is also disposed of at five shillings per ton.

When the tins have to be carted any considerable distance it will generally be found profitable to crush them, as by so doing a very much larger weight of tins can be loaded into a cart, railway truck or barge than would be possible if they retained their original bulk. Tin crushing machines are manufactured by Messrs. Joseph Adamson & Co. of Hyde, Cheshire, and Messrs. C. Whittaker & Co., Ltd. of Accrington. A point that should be noted is that the tins must not be crushed absolutely flat, as if this is done they are not so suitable for treatment for the recovery of the pure tin and solder, and consequently their value is depreciated. They should be flattened only to such an extent as to leave it possible for the chemicals used in the process of recovery to play all over their surfaces.

The Manufacture of Fish Manure.—In many towns a special plant is in use for dealing with fishmongers' refuse, which, if burned in the ordinary way in the destructors, creates a considerable nuisance on account of the smell, more especially as by the time it reaches the works it is rarely fresh. Fish refuse, if dried, makes a very good manure, containing about 10 per cent. of ammonia, and 20 per cent. of phosphate of lime. There is also a very good demand for it, its value being about 6 pounds 10 shillings ($31.50) per ton on the rail. The corporation of Blackpool has installed a plant which consists of an inner and outer cylindrical shell, tehinner one of which has radial arms, fixed to a center shaft driven by an electric motor. The fish refuse is fed into the inner shell and is broken up by the revolving arms. Steam at 100 pounds pressure is admitted to the space between the two shells, which drives off all moisture, the vapor being led away to the main combustion chamber. After being thoroughly broken up and dried, the manure is passed through a crushing mill, when it is ready for use. The cost of producing the manure works out at about one pound per ton, and it is sold at four pounds per ton.

In a paper read before the Association of Cleansing Superintendents in 1904, Mr. E. Call gives some particulars of the working of the fish manure plant of the Bradford Corporation. During the year 1903, 322 tons of fish refuse were dealt with, the revenue from which amounted to 260 pounds, of which about 200 pounds was clear profit.

Manufacture of Poultry Food.—Poultry food is manufactured at Blackpool from oyster shells, which are taken to the destructor works and crushed in a mortar mill. The value of the food is 7 shillings per ton.

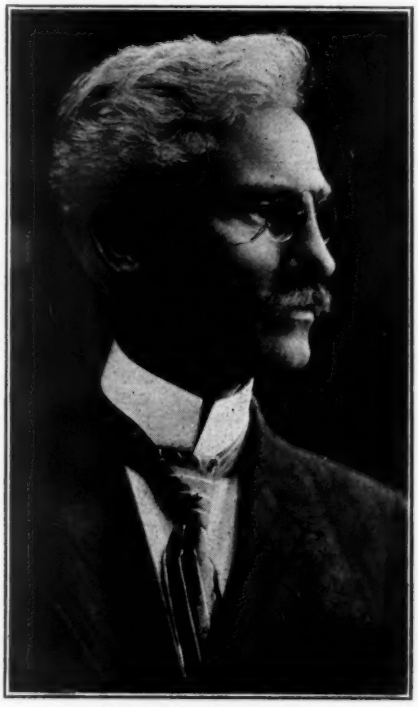
The City of Erie, Pa.

THE city of Erie has selected as the place for the next convention of the American Society of Municipal Improvements, in accordance with the policy which that association has followed for several years, and because of the attractive invitation given by Benjamin E. Briggs, who has been the city engineer for thirteen years through several changes in administrations. Erie is a progressive city of perhaps 70,000 population with one of the best harbors on Lake Erie, and is a bee hive of manufacturing industries, claiming to produce more engines and boilers than any other city in the world, and being almost equally notable for other metal products, electrical machinery, and with many other industries.

Location and favorable freight rates account for much of this, but the city government seems to be equal to its requirements, so that taxes and bonded indebtedness are low, while good service is given both in making public improvements and in operating public service industries. With an assessed valuation of more than twenty-five million, corresponding to some eight hundred million full value, the bonded indebtedness is only about $770,000 and a sinking fund of $410,000 is on hand to help extinguish this. The city tax rate is only 14 cents and the school tax 9 cents per $100.

Street car service reaches all parts of the city with 25 miles of line and there is interurban service to Cleveland, Buffalo, Chautauqua Lake, Warren, Meadville and Linesville, west, east and south. The electric lines have parks at Waldameer and Four Mile Creek, both on Lake Erie, and the city has 131 acres in four parks in the center, east, west and south, besides the lake side park along the harbor bay and Presque Isle, with its 175 acres of water works park and some 3,000 acres as yet undeveloped.

The city is thoroughly sewered and is now constructing intercepting sewers and a sewage disposal plant, which will be described more fully hereafter. It is now beginning the solution of the problem of garbage collection and disposal on modern lines.



BENJAMIN E. BRIGGS
City Engineer, Erie, Pa.

Two electric light and power plants, a heating company, a natural and an artificial gas company supply light, heat and power at more than usually liberal rates.

Thirty-three miles of the city's streets are paved with asphalt, and fifteen miles with brick and there are

still three miles of cobble-stone pavement left. City Engineer Briggs has devised systems of taking care of the repair of streets which reduce the expense to a minimum at the same time that they are very efficient. The methods and results have been reported from time to time in MUNICIPAL ENGINEERING and are worthy of careful study by other city engineers.

The water works of the city are remarkable for many things which demonstrate the efficiency of their management. The three members of the board are appointed, one each year, by the Court of Common Pleas of the county and are thus removed as far from politics as possible, especially since they manage the works in practical independence of any other department of the city government. One member of the board has been in office four years, another nine, and another, who is a civil engineer, fourteen. The secretary has been in office first for eighteen years as assistant and then for eight as secretary. The present mayor was a commissioner for nine years.

The water supply has heretofore been taken from the harbor, but an intake from Lake Erie on the outside of Presque Isle peninsula and settling basins on the peninsula are now practically completed and will shortly be in use. This will be one of the points of interest for those attending the convention of the American Society of Municipal Improvements. The accompanying photographs show first, the pumping station as seen from the bay; second, the swimming pool on the shore of the bay just to the right of the view shown in the first picture; and third, a view of the pool and the dressing cabinets and boathouse, taken from the roof of the pumping station. Further details of the new water works construction will be given later.

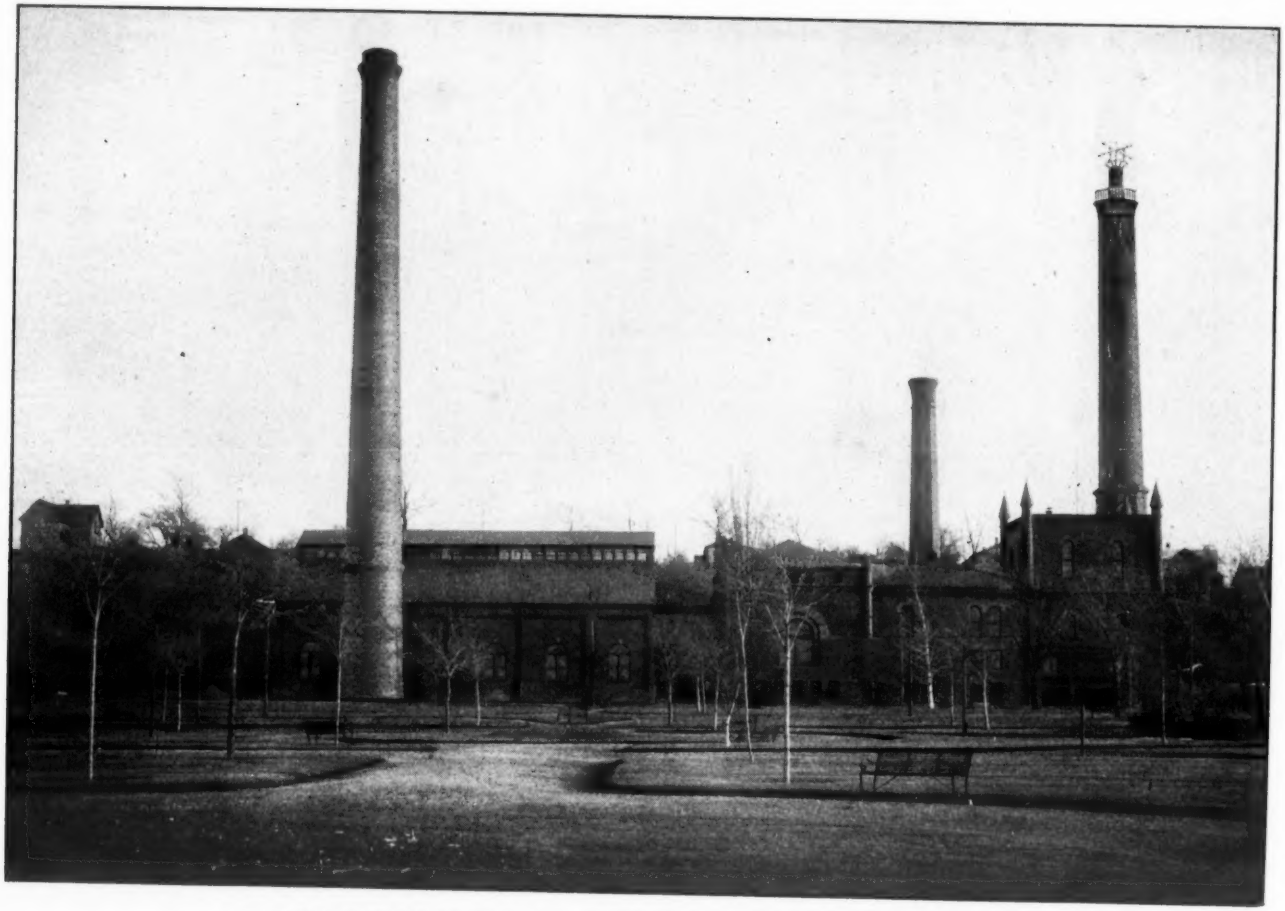
Purification of Dye Water

By Henry G. Crocker, Washington, D. C.

PURIFICATION of streams into which waste dye water has been turned from an ever-increasing number of woolen mills in this country and Europe has been one of the most difficult problems which has confronted the municipal boards. The subject has been brought forward again and again, and attempts have been made repeatedly to find a solution of the problem, but without success.

Recently, however, an experiment has been conducted in Yorkshire, England, upon a commercial scale and under the most exacting and difficult conditions, which promises to deliver the trade from an exceedingly difficult position. A plant was erected at a cost of more than 400 pounds ($1,950), and it has now been working daily for some time, turning out an effluent which, if not always colorless, is quite clear, entirely free from acid, and altogether innocuous, at a cost for labor and materials of less than two-thirds of a penny (1 1-3 cents) per thousand gallons treated. The plant is exceedingly simple. It consists of three parts—an elevated tank carried on brick piers, an old 30-foot boiler, with the flues removed and the ends made good, set at an angle of about 30 degrees, and another old boiler converted into a filter and standing vertically on end, all of which are connected by pipes 4 inches in diameter, having the necessary controlling valves. The plant is designed to deal with an average flow of 30,000 gallons in ten hours, but the flow may on occasion exceed 3,000 gallons in the hour. The elevated tank is simply a wooden reservoir about 20 feet by 10 feet, to hold about half a day's quantity. Into this tank the crude dye water is pumped, and here it receives an admixture of lime in the proportion of 3 or 4 pounds of dry lime to every thousand gallons of the liquor to be treated.

From the tank the liquor is carried by a pipe to the bottom of the tilted boiler, or, rather, cistern—for it is only as a cistern that it is used. The outlet from the boiler is at the top of the incline, and the liquor flows in at the bottom—therefore against the whole weight of the contents of the cistern. It is in this device of using an inclined cistern from which all air is excluded for the purpose of a setting tank that the efficiency of the process consists.



I. WATER WORKS OF ERIE, PA. PUMPING STATION AS SEEN FROM BAY.

The Municipal Abattoir and Reduction Plant at Paris, Texas

By Ed. H. McCuistion, Mayor, Paris, Texas

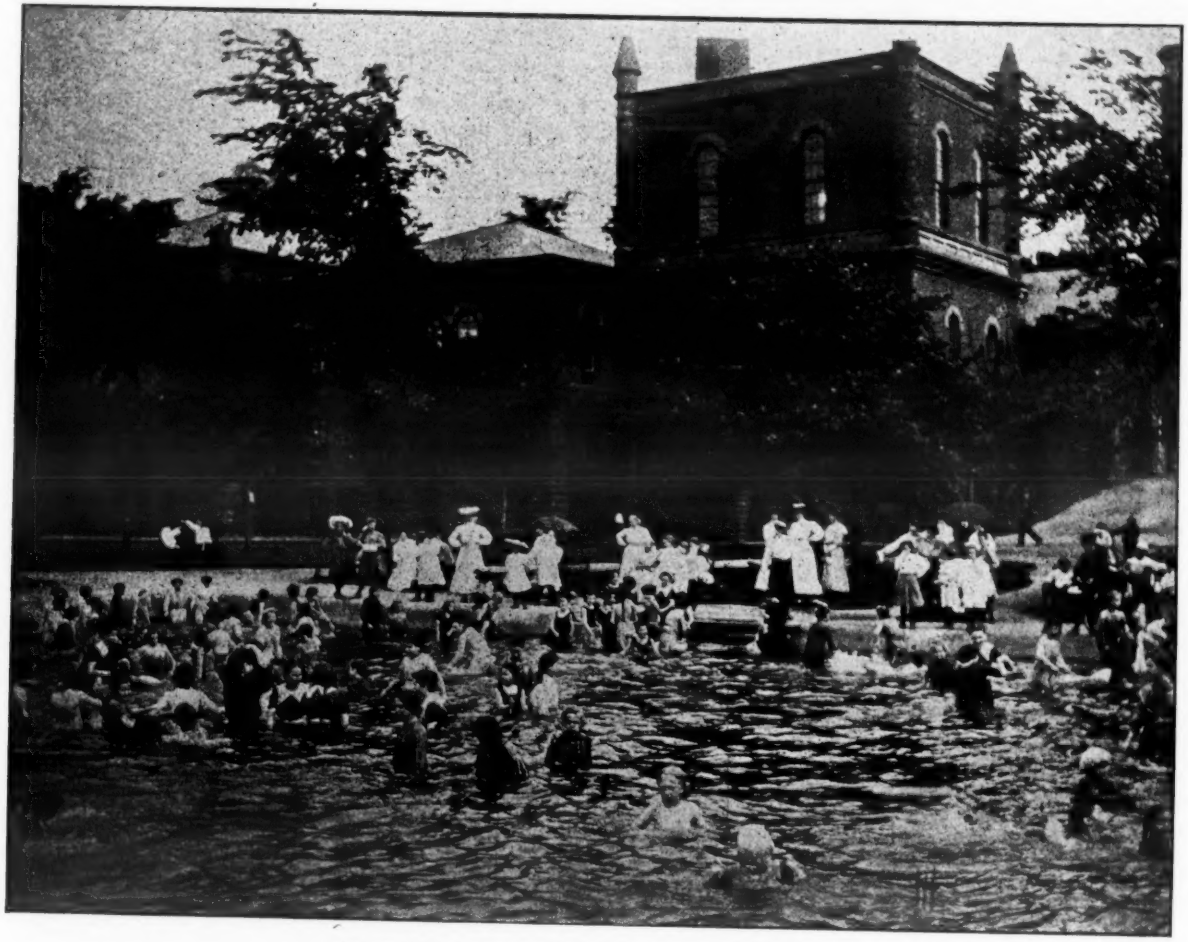
THE successful installation and operation of small abattoirs or at least of plants adapted to the requirements of small cities, marks a distinct advance in sanitation as it relates to meat food products. On the 1st of December, 1909, the city of Paris, Tex., commenced the operation of a plant, which, judging by the interest manifested, has attracted wide attention both in the United States and Canada. While we usually refer to it as the abattoir, as a matter of fact it is really more; it is a combination abattoir, cold storage and reduction plant.

The complete cost and equipment of it was $10,000.00. It is situated on one of our main streets just about one mile from the center of the commercial district of the city. Our equipment consists of a sixty horsepower boiler and a twenty-five horsepower engine, steam being the motive power used. The refrigeration is produced by a ten-ton ice machine, so arranged and constructed as to produce excellent dry refrigeration. The killing room and the chill and refrigerating rooms all have solid concrete floors, which are carefully laid to grade, trowel-finished and equipped with bell traps, which insure not only prompt, but perfect, drainage, and each trap being equipped with water seal, guarantees that these rooms will not become contaminated with sewer gas.

The reduction machine used by us is manufactured by Wannenwetsch & Co., of Buffalo, N. Y. It stands on end and looks almost exactly like an upright boiler. The charge is put in at the top, which is on the second floor of the building. When it is filled and sealed, steam is turned on through a steam jacket which lines the boiler, and a vacuum pump is put immediately to work, which takes off the gases liberated by the cooking process. These are conducted through a condenser, and all that can be condensed are then trapped out to the sewer. Those that cannot be condensed are carried by an iron pipe and discharged immediately under the firebox of the boiler, and are carried by the draught through the fire-tubes of the boiler and the smoke-stack and have never given us any trouble.

The cooking process in the rendering tank is continued, depending somewhat upon the character of the charge, for about 5 to 7 hours, then the steam is cut off and the charge immediately begins to settle. The bones and all solids go to the bottom, the water (called stick water) is next and the grease is on top. When time is given for this arrangement to have fully taken place, the operator then draws off the grease through a valve and then the stick water in the same way, which goes into the sewer. When this is finished the valves are closed and steam is again turned on, and the drying process begins. This takes from 4 to 6 hours, making in all usually from 12 to 14 hours. When dry and thoroughly macerated, or I should more properly say, powdered, a cart is backed up to the base of the cooker and the hermetically sealed door is opened and the agitator pushes the entire charge into the cart. This product is called tankage and is sold by us to the farmers for fertilizer. It is worth by actual analysis $23.49 per ton, and is well balanced in its chemical proportions.

The reduction plant performs two very important functions. All offal, blood, feet and waste from the killing room are carried by hoist and overhead trolley to the reduction room and emptied into the rendering tank. Then all the dead animals which accumulate in or about the city are at once removed to this plant. Such as hogs, dogs, cats, rats, chickens, etc., are put in whole, but cattle and horses are skinned and quartered before being placed in the tank. Every well-equipped plant should have two tanks, so that while one charge is being cooked the other tank is being filled. In this way the entire premises can be kept perfectly sanitary and almost absolutely odorless. The cooking process does not emit odors as one would naturally think, no matter how putrid the charge, if the operator is careful to seal his tank properly. There is an odor to the tankage which, while entirely distinct from a putrid odor, is nevertheless unpleasant, and it should be removed to a warehouse about 100 feet away and no inconvenience will be experienced.



II. WATER WORKS SWIMMING POOL AT ERIE, PA.

Our reduction plant is so intimately associated with the balance of the plant that it is impossible to determine with absolute accuracy, but it is our judgment that the reduction feature of our plant is self-sustaining. The products of the plant are tankage and tallow, the first being worth $23.49 per ton and the latter on an average 5 cents per pound. In addition a further small income is derived from the horns of cattle and the tail-brushes of both.

I have apparently laid considerable stress on the reduction feature of the Paris plant, but I would have those who are interested bear in mind the very important function performed by such a plant in the successful management of the abattoir proper.

In adapting the size of an abattoir to the requirements of a particular city the data in most instances can be secured from the local meat cutters. In this city we tabulated these data as carefully as we could and reached the conclusion that a killing room 22 feet square and a chill room 10x11, and then a refrigerating room 22x40 would about give us the capacity we desired. Paris has a population of about 15,000 and consumes on an average of 150 beeves, 200 head of hogs and 50 calves and sheep per month. In the summer months the number of hogs will be diminished and the number of beeves will be slightly increased, though more meat is consumed in the fall and winter months than during the summer. Our refrigerating room is supposed to hold 75 beeves and 100 head of hogs. One feature of our cold storage deserves special mention. The ammonia pipes are all overhead and so arranged that if the frost melts off the water is caught and trapped out of the building at once, thereby keeping the air dry and keeping all the carcasses free from slime and discoloration.

On the same lot with the abattoir are located stock pens, where all the local butchers deliver the animals they wish slaughtered. Our inspector then makes the live inspection. From the pens through a runway, which is screened, they are driven and slaughtered. The hide is removed from the cattle, the offal and blood are sent to the rendering tank and the carcass is rolled upon the inspector's rail for the dead inspection, which includes an inspection of both the carcass and the viscera which have been removed from it. When properly stamped and tagged, it goes into the chill room, where it remains usually about 12 hours, at a temperature of 40 degrees. The carcass is removed into the refrigerating room, where it remains at a temperature of 30 for four days, without charges for refrigeration, but after the four days 10 cents for beeves and 5 cents per day for hogs, sheep and calves is charged for cold storage.

When the carcasses are called for by the meat cutters they are rolled into a checking room, a bag with a drawstring is slipped over them and carefully tied so as to preclude the possibility of contamination by dirt or dust. These are then placed in a specially built wagon and carefully protected from dust, flies, etc., by a further covering and delivered to the meat cutters.

The following is a detailed statement of our April business

INCOME.

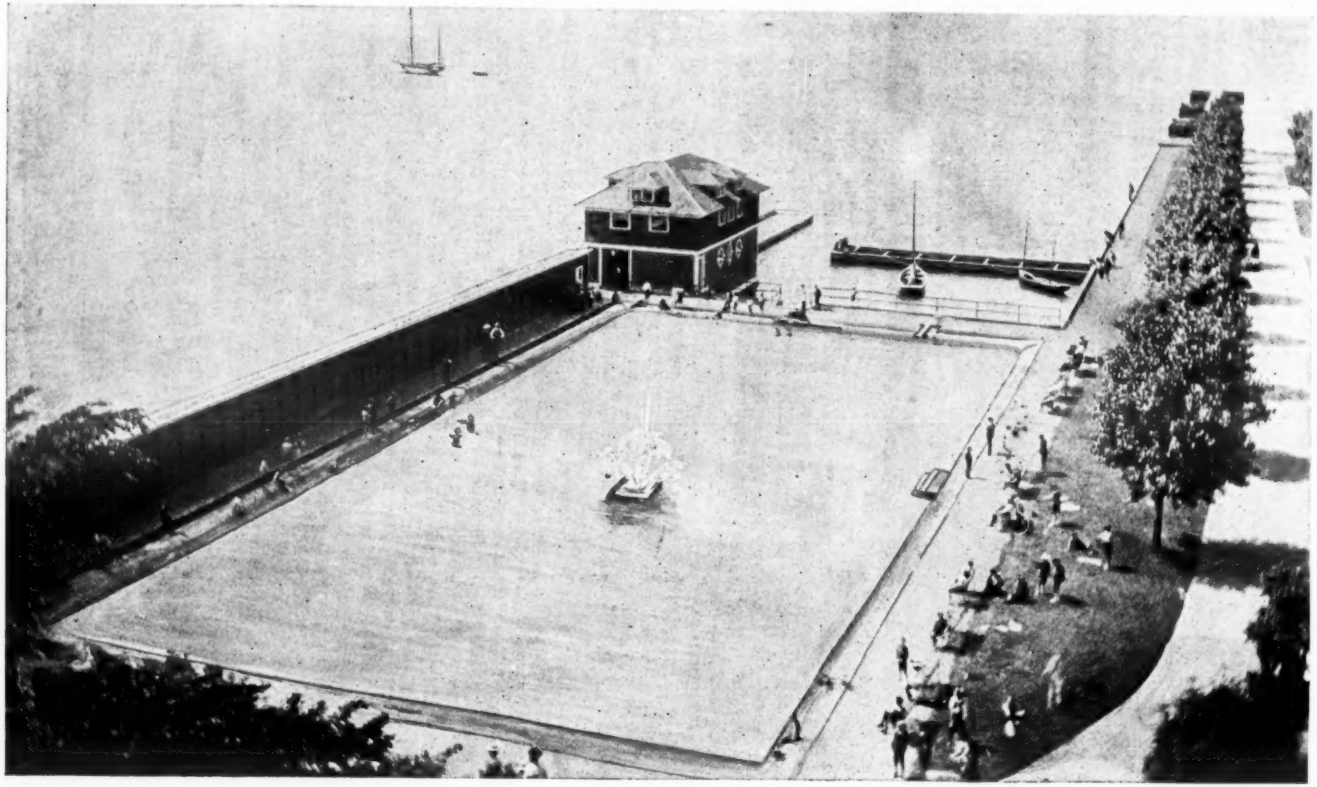
Beeves—149 at $1.25	$186 25
Hogs—152 at 75c	113 00
Calves—30 at 75c	22 50
Tallow—2,819 pounds at 5c	140 95
3 hides	5 60
Tankage, $20.00	100 50
Inspectors' fees	43 05
Total	$611 85

EXPENSES.

Inspectors' salary	$100 00
Engineer and manager	75 00
Slaughtering (contract)	175 00
Dead-stock man	45 00
Night help	60 00
Fuel, oil and waste	100 00
Total	$555 00
Balance to credit	$56 85

It will be observed that the charge of $1.25 for beef includes the live and dead inspection, the slaughtering, cold storage, and delivering to the meat cutter's shop. The 75 cents for hogs, sheep, goats and calves includes the very same services.

When the expediency of such a plant was under consideration our meat cutters did not manifest a disposition to enter heartily into the plan, but its practical operation has pleased them all, and there is not one who would willingly go back to the old order of things. No city where slaughtering is carried on in the old primitive way will continue it when modern abattoirs are once brought to its attention.



III. WATER WORKS OF ERIE, PA. BOAT HOUSE, DRESSING CABINETS AND SWIMMING POOL.

Hydrated Lime

By Richard K. Meade, Nazareth, Pa.

TO combinations of an oxide with water the chemist gives the name hydrate. The compound composed of sodium oxide and water is called sodium hydrate. Similarly, the compound composed of calcium oxide, popularly known as lime, with water is called calcium hydrate, or more familiarly, hydrated lime.

This compound is formed when 56 parts of lime unite by slaking with 18 parts of water, and hence is composed of 76 per cent. lime and 24 per cent. water. If we should add more than 18 parts of water to 56 parts of lime, the quantity of water in excess of 18 parts would either be driven off by the heat generated in slaking, or else if much in excess would remain with the slaked lime. The excess of water does not combine with the lime, but merely stays behind as water, forming with the lime a wet mass or putty. This is what takes place when lime is slaked by the mason in the mortar box. Fifty-six pounds of lime can combine with only 18 pounds of water, no more, no less; and if the proportions of water and lime have been greater than 18 to 56, as is always the case with hand slaked lime, the water remains in the box as such, forming with the hydrated or slaked lime, the lime putty which the mason uses. If the proportions of lime and water are exactly or very nearly 56 to 18, all the water is absorbed by the lime and the product is a dry powder and this dry slaked lime is called hydrated lime. Thus hydrated lime is nothing more than dry slaked lime.

If a lump of lime is left in the air it gradually falls to a powder or air slakes. There is always present in the air moisture, and if this were the only compound in air, air-slaked lime would be just as good as hydrated lime or lime putty. Unfortunately, however, the air also contains carbon dioxide. This latter gas unites with the lime to form carbonate of lime, or limestone. In other words, the carbon dioxide of the air unites with the lime to form the substance from which lime was made; namely, limestone, so that when lime is air-slaked, while a small quantity of hydrated lime is produced, there is also a large quantity of carbonate of lime formed, and this latter is as inert and incapable of furnishing a mortar as would be so much ground limestone.

Hydrated lime itself does not absorb carbon dioxide from the air, provided it is dry, neither does it absorb moisture. Lime, on the other hand, absorbs moisture greedily from the air ,and at the same time along with it a large quantity of carbon dioxide. This is why hydrated lime will keep indefinitely, while quick lime rapidly slakes, and falls to a powder. Quick lime in slaking increases in volume and constantly swells and bursts its barrels. Hydrated lime absorbs nothing on storage, consequently it does not swell or change its volume, hence there are no troubles with bursted barrels and consequent loss.

When lime slakes, as every one knows, a great deal of heat is given off. This heat is due to the chemical reaction between the lime and the water. When charcoal burns in air, heat is given off because the carbon, which charcoal is, unites with the oxygen of the air, and this is what we call burning, because heat and light are given off. In the case of quick lime, exactly the same sort of process takes place. Heat is given off, although no light. One pound of lime in slaking gives off 2,700 British thermal units, or in other words, 5½ pounds of lime will give off just as much heat in slaking as one pound of coal will in burning. This explains why so many fires occur in lime storehouses and in sheds in which lime is kept. Rain, or even the moisture of the air gets to the lime, slakes this, and fire results from the heat generated, this usually starting with the wooden staves of the barrels, etc. With hydrated lime on the other hand, the lime has already combined with its fill of water and hence can not combine chemically with any more water, and as no chemical reaction can take place no heat will be generated. Lime, therefore, may be considered as a combustible body, liable to give off heat by uniting with the moisture of the air, etc., just as coal will give off heat by uniting with its oxygen. Hydrated lime, on the other hand, is as inert and incapable of giving off heat as so much well-burned ashes. In the storage of hydrated

lime, therefore, there is no danger of fire and it may be shipped in paper and cloth bags. This freedom from fire risk, makes hydrated lime an ideal substitute for quick lime so far as the dealer is concerned.

For the processes of hydrated lime manufacture, where this is done thoroughly and to the best advantage, considerable machinery is required. The lime is first crushed to one-fourth inch size and under in order that the water may have a chance to get to it thoroughly. The crushed lime is then mixed with exactly the right quantity of water required to hydrate the lime. This water is determined by experience, and such an amount is added that the lime will be completely hydrated, and that the small amount in excess, which is always necessary, will be driven off as steam by the heat given off by the lime itself in hydrating. The mixing of lime and water is usually done in large steel cylinders. In these the lime and water are thoroughly mixed with paddles, so that every particle of lime comes in contact with water. After the lime has been thoroughly hydrated, it is passed over screens. These separate the fine hydrated lime from any unhydrated cores or lumps. This explains why hydrated lime is superior to lime slaked in the mortar box.

In order to keep lump lime it is necessary to burn the latter so that the outside of the lumps are slightly fused or over-burned. If this were not done, the lime would slake in transit, when shipped in bulk. There is also present in all limestone a small percentage of sand and this unites with some of the lime in burning to form clinkers. This hard over-burned lime, and also these clinkers do not slake readily with water, therefore, when lime is hand slaked, unless the latter is given considerable time to season in the mortar box, these hard cores do not slake. When the mortar is applied to the wall, however, slaking of the cores gradually takes place. Since slaked lime occupies more bulk than quick lime, the slaking of these cores causes expansion or "popping" and this makes itself evident in the form of blisters and blow-holes in the wall. In the mortar box method of slaking, these cores frequently remain unslaked, while in well made hydrated lime they are screened out.

Hydrated lime can be used for every purpose for which quick lime is used, and also for all purposes for which lime putty is used. It has also some uses which neither have. It, however, does not trowel quite so easily as lime putty, and this has been the greatest objection on the part of the mason to its use. By employing a good deal of water in the mortar, however, this objection can be to a great extent removed. The greater convenience with which it can be handled and used, however, and the thoroughness with which it has been slaked, to a large extent make up for this trouble. No mortar box is required and the hydrated lime and sand may be mixed upon a board, just as are cement and sand. It is, therefore, especially convenient for doing small jobs, such as repairs to plaster, etc.

It is estimated that it costs 25 cents per barrel to slake lime in a mortar box. This expense is saved by the use of hydrated lime. Furthermore, the mixing can be done indoors and in cities the streets are not blocked.

In using hydrated lime the mason should remember that not quite as much water would be required as is the case with lump lime, because in the case of quick lime some water is needed to combine with the lime, and in case of hydrated lime this water has already been supplied by the manufacturer. Where a mortar box is used, it is usually considered best to first place the water in the box and then the lime. More water and then lime can be added as necessary, the idea being to get a thorough mix of water and lime. It is usually considered better to allow the mixture to remain over night. Such a mortar can be used just as lime putty, and if plenty of water has been employed, will trowel very similarly.

One place where hydrated lime can be used, where ordinary lime putty can not be employed, is with Portland cement. The addition of lime to Portland cement is not an adulteration, but confers a great many good properties to the latter. It has long been known that slaked lime would waterproof concrete. This is due to the fact that it exists in the form of an extremely fine powder, many times finer than the finest ground cement. This fine powder fills in the pores of the concrete and stops them up, thus excluding the water. Owing to the difficulty of mixing the wet lime putty with the dry cement and sand, however, it has only been since the introduction of dry hydrated lime that slaked lime could be used for waterproofing. It is generally considered that hydrated lime is the best waterproofing compound which

can be added to cement, and that it is superior in lasting qualities to any of the water-proofing compounds at the present time advertised for this purpose. The writer has tested some eight or ten of these compounds. In every instance, without exception, they decreased slightly the strength of the cement mortar made therefrom, and he does not think that any of the manufacturers claim that they add to the strength of concrete. Hydrated lime, on the other hand, not only waterproofs the concrete, but numerous tests made in different laboratories by disinterested parties show that additions of hydrated lime up to 15 or 20 per cent. increase the strength of cement mortar.

As an actual waterproofer, hydrated lime is not surpassed by any of the waxes and paraffin compounds at the present time used for this purpose. Many of these compounds are organic, and in time will volatilize, leaving the concrete porous. Hydrated lime, on the other hand, is inorganic or mineral and will remain where it is put.

As an example of the waterproofing properties of hydrated lime, this was employed upon a large gas holder at Kingston, Ont., which had been practically a failure, owing to the leakage of the concrete wall of the gas holder. A number of waterproofing methods were tried, all of which failed, and it was not until this wall was chipped back from three to six inches by means of pneumatic chisels and a new wall composed of concrete, containing about 18 per cent. of the weight of the cement of hydrated lime had been added, that the tank was waterproof.

The addition of hydrated lime to cement makes the latter more plastic and easily trowelled. It also improves the adhesive properties. A mixture of equal parts of hydrated lime and Portland cement makes an ideal mortar for laying brick. The addition of hydrated lime to concrete blocks makes the latter whiter, tougher, and waterproof.

Hydrated lime is not only the best but also the cheapest waterproofing compound known, since it replaces so much cement and the only additional cost is the difference between the price of cement and hydrated lime, which is slight, even at the present low price of cement.

For household, agricultural and industrial purposes, where only a small quantity of lime is used and where storage in the cellar or a shed upon the premises is desirable, hydrated lime is unsurpassed, owing to the fact that it can be easily mixed and handled, keeps indefinitely, is put up in small paper packages (40 lbs.), and finally that there is no danger of fire from it. Lime has long been used as a disinfector, for whitewashing, for fertilizing, for spraying fruit trees, for purifying of water, for marking lawn tennis courts, and for all of these uses hydrated lime possesses every property of quick lime. For such uses as water purification, disinfecting, fruit spraying, etc., magnesian hydrated lime has only about one-half the value of the high calcium hydrate.

Hydrated lime is usually packed in 40-lb. paper bags or 100-lb. cloth bags. The paper bags are of the valve type, and are pasted shut at both ends, presenting a square package, which can be easily handled and, owing to the absence of the rough tied end found in cement bags, can be closely packed. Below are some standard formulas for the use of hydrated lime:

GENERAL DIRECTION.

First cover bottom of mortar box with water and add the hydrated lime and more water as is necessary. Some mechanics prefer to soak the hydrated lime at least twelve hours before using, claiming more plasticity in its manner of working.

FOR PLASTER MORTAR.

First or Scratch Coat.—350 lbs. hydrated lime, ¼ yard screen sand, 2 bushels hair. Should cover about 100 square yards.

Second Coat.—200 lbs. hydrated lime, ½ yard screen sand. Should cover about 100 square yards.

Putty or White Coat.—Use about one-half as much plaster to gauge with as is commonly used with putty made from lump lime. If wall is dry sprinkle or dampen with brush before putting on white coat as labor will be lessened.

Float Finish.—300 lbs. hydrated lime, ¼ yard screen sand. Should cover about 100 square yards.

For Stone Mortar.—200 lbs. hydrated lime, ⅝ yard screen sand and add water.

For Brick Mortar.—250 lbs. hydrated lime, ⅝ yard screen sand.

HYDRATED LIME AND PORTLAND CEMENT MIXTURE FOR LAYING BRICK AND STONE.

For hard mortar for these purposes use equal parts by weight of hydrated lime and Portland cement. Add re-

quired amount of sand to properly gauge up mortar.

FOR WATERPROOFING CONCRETE AND CONCRETE BLOCKS.

Replace 15 to 20 per cent. of the weight of the cement used in the mortar by hydrated lime.

To Sum Up the Advantages to the Dealer.—It is first of all a fixed product which does not deteriorate or change with age, nor swell and burst its packages, consequently it is always worth the market price of lime. Second, it can be handled without risk of fire, and, third, it can not only be used for all purposes for which lime is used, but also has many new uses, and is more convenient of application.

It has been aptly said that hydrated lime is the twentieth century way of handling the lime trade.

The Water Works of Springfield, Ohio

THE first trustees of the Springfield, O., water works were O. S. Kelly, J. H. Thomas and George H. Frey. These men met to organize on January 19, 1881. About one year previous all of these trustees were members of council and that council in March of 1880, by resolution, appointed a special committee to investigate the subject: "as to the necessity for a water works system and whether the same should be constructed and owned by the municipality, or, whether it would be better to give the franchise to a private company." This committee, notwithstanding the opposition of many citizens and the efforts of those who wanted the franchise, recommended that the municipality should install and own the water works.

The original works contemplated an expenditure of $400,000, but, when completed as planned, the records show the real cost to have been $389,823.43, a difference of $11,176.57.

The original plans contemplated a pumping station of a total capacity of 4,000,000 gallons every twenty-four hours, with twenty-nine miles of water mains ranging from four to twenty-four inches in diameter and with three hundred fire hydrants distributed throughout the city. Also a stand-pipe with a storage capacity of 592,000 gallons and the purchase of seventy acres of ground.

The principal trouble in the past has been the supply end of the business. The aim has been at all times to provide water from a subterranean source. The history of all water works where the attempt has been made to supply the growing demand from a subterranean source, that is supplied by rainfall on large surface and thus stored in the gravel strata, has been, that during the drought period covering a shortage of rainfall for sometimes two or three succeeding years, the storage capacity is not sufficient to carry over until the more abundant rainfall seasons, which increase the volume of springs and restore the depleted storage in the gravel strata.

The nature of the valley, in which the pumping station is located, is as follows: First, four feet of black loam, then eighteen feet of coarse gravel, then the hard pan. The well from which suction is taken is thirty feet in diameter and excavated through the loam and gravel to the hard pan, a depth of twenty-four feet. Thus as the level of the water in the well is lowered the water level in the gravel stratum all over the affected district is lowered. The voids in this gravel stratum are twenty-five per cent. of the cubic contents, giving a storage of about 87,000,000 gallons.

The gravel deposits from which the water is at present derived are about 155 acres in area with a depth to hardpan varying from 28 ft. near the collecting well to 16 ft. near the boundaries of the deposits. They are separated by a narrow point in the valley from other gravel deposits lying in a much larger basin to the northwest. The depth of hardpan in the upper deposits varies from 28 to 21 ft. below the surface, as far as the borings show. The absolute level of the hardpan in the lower deposits varies about 10 ft. while in the upper deposits the variation is not over 8 ft. The water level, of course, in the lower deposits varies greatly with the amount of water being pumped, and in both deposits with the dryness of the season. In 1900 the water level in the lower deposits varies from 1 to 11 ft. below the surface of the ground, the absolute difference in level of the ground-water surface being about 17 ft. In the up-

per deposits the depth below the surface of the ground varies from 2 to 5 ft., while the absolute variation in the level of the surface of the ground water is about 10 ft. The effect of pumping is noticeable in the lower basin in the great variation of the water level, both with respect to the surface and datum plane. A profile taken longitudinally through both gravel deposits and giving the elevation of the water level would show no very abrupt change in the passage from the upper deposits to the lower. The land owned by the city lies entirely in the lower deposits on the east side of Buck creek and is about 56 acres in area. This includes the land on which the pumping station, collecting well and open reservoirs are located and in which the supplemental system and distributing tile are laid.

During the most severe and continued drought period, seven months of 1908, this effective gravel bed without the assistance of any rainfall supplied three and one-half million gallons per day.

The city's demands are no less than 5,000,000 gallons. The creek water, especially during the summer months, is not potable without filtration. The elevation and location of the water works land is such that by installing a distributing system the creek water could be flowed on to all, or, any part of this surface at will and there it could percolate down through the four feet of loam and into the eighteen feet of gravel strata and travel a horizontal distance of three-fourths of a mile to the well. This idea has been adopted and a reinforced concrete dam was built and is now in use and giving better service than anticipated. This dam is so located and the elevation is such that mechanical filters can be installed at the pumping station with a capacity of the full volume flow of the creek, if necessary, 25,000,000 every twenty-four hours. It is evident, therefore, that this plan will provide an abundance of water until the city reaches 300,000 inhabitants.

The accompanying photographs show the interior and exterior of the pumping station. There are three sets of pumps, one 10,000,000, one 7,000,000 and one 5,000,000 capacity. The water pumped during 1909 averaged 4,226,164 gallons per day, or a per capita consumption per day (based on a population of 40,000) of 105 gallons.

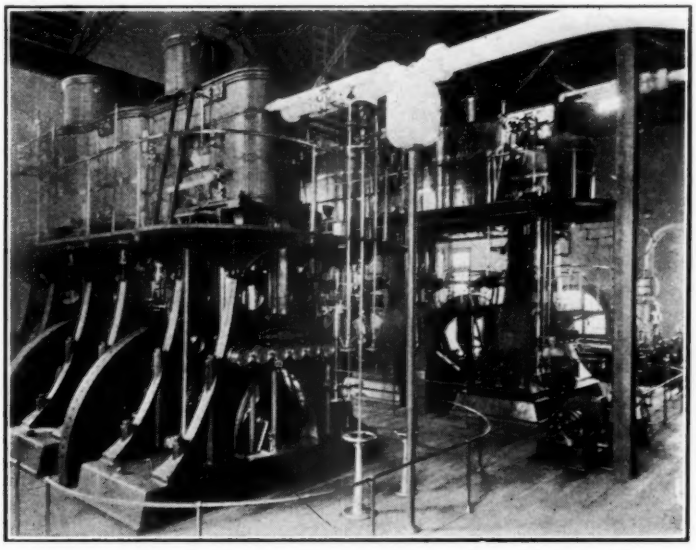
But where meters are installed on domestic service this per capita consumption is reduced to thirty-eight gallons, or a reduction of sixty-three per cent. Assume that sixty per cent of the total water is used for domestic purposes and the balance of forty per cent goes to business, fountains, street flushing, manufacturing, etc. Taking then for comparison sixty per cent of the total water pumped in 1909 (925,533,225 gal. domestic service) then apply the sixty-three per cent reduction in consumption due to the installation of meters, this amount is reduced to 342,447,294 gal. or 36 gallons per day per capita for domestic service. Now take the business houses, factories, etc., and suppose they consume twenty per cent of the total water pumped, leaving twenty per cent as representing free use, such as schools, city building, fire and police department, street flushing and sewers, then twenty per cent of the total water pumped last year is 308,511,075 gallons for factories, etc., and a like amount for public purposes. Experience shows that in the use of meters the waste of water in this class of service (business and factories), is reduced approximately fifty per cent. This would reduce the consumption of water in business houses and factories from 308,511,075 to 154,255,537 gallons. Then allowing the free use for municipal and fire purposes to remain at 308,511,075 gallons per year, the total consumption for a year, instead of being 1,542,555,376 gallons as consumed in 1909, under the meter system, would be 805,513,888 gallons, a reduction of 737,341,488 gallons, or, forty-eight per cent.

At the close of business December 31, 1909, the total mileage in the distributing system was 85 37-100 miles, ranging from three to twenty-four inches in diameter with 742 valves, 622 fire hydrants and 7,168 private services. The increase of private services averages about 300 a year. The revenue from new business is about $2,000.00 a year.

The system is a stand-pipe system. The pressures on the distributing lines due to the differences in elevation at the minimum vary from 38.2 to 97.8 pounds.

Within a short time the superintendent will have plans for the installation of a motor-operated valve on the twenty-four inch line running into the stand-pipe and while the stand-pipe will always be in use, yet, when an alarm of fire comes into the pumping station, the engineer on duty will throw in a switch and immediately the valve on inlet to stand-pipe will close and the pumps will be speeded up to

WATER WORKS PUMPING STATION AND SMALL RESERVOIR,
SPRINGFIELD, O.



INTERIOR OF WATER WORKS PUMPING STATION, SPRINGFIELD, O.

produce whatever pressure is desired up to 250 pounds, if need be.

The water plant could then take the place of most of the fire engines now in service at a saving of $1,460.00 a year, equivalent to an investment at six per cent. on $24,000.00, while the actual cost of the equipment and installation would not be more than $5,000.00 and in the operation the cost would be nothing.

At the close of business December 31, 1909, there was invested in the water works $905,120.03, with a balance of indebtedness outstanding of $345,000. The retiring of the capital invested differs from the plan of any private corporation in that they never retire their capital stock.

The cost of operation of the water works approximates about $26,000 per year. For the year 1909 the cost was $22,451.84; 1907, $27,093.13.

The water department has voluntarily asked for reductions in appropriations several times in the last two years. These good results as to economy in operation are due almost exclusively to the elimination of politics.

The total revenue of the department for 1909 was $77,541.75. The operating and maintenance costs were $22,451.84. Taking an average cost of operating and up-keep of $25,000 and an income of $80,000, the net earnings would then be $55,000 per year, or six per cent. on an investment of $916,666. But to find the real value of the investment a value must be placed on the free use of water, and from such value deduct the amount of taxes if the works were owned by private interests.

An estimated value of the free use of water is as follows:

Schools (actual)	$ 2,200.00
City building	1,000.00
Flushing streets and sewers.	2,500.00
Parks	1,200.00
Fire and police department..	800.00
Fountains and water troughs	4,000.00
622 hydrants at $30 each....	18,660.00
Cemeteries	500.00

Total value of free use of water $30,860, less $12,000 for taxes, leaves $18,000, and adding this amount to the revenue of $80,000 per year gives us the real income as $98,000. Then taking operating cost at $25,000 leaves a net income of $73,000. Capitalizing this net income at six per cent shows a value of the works of $1,216,666, or, $311,545.97 more than the works cost.

The department, during the last year, has investigated rates in use in other cities, in order to make comparisons. Data from 375 cities ranging in population from 25,000 to 50,000, 165 being private plants and 210 municipal, show an average cost on the basis of a six-room house, with kitchen sink, bath, closet, wash basin, sprinkling 50x140 feet lot and street, as follows:

Domestic service.	$6.83	$6.04	$4.00
Bath	3.88	2.99	2.50
Closets	3.69	3.12	2.50
Wash stand	1.94	1.55	....
Sprinkling	6.17	4.37	5.00
Totals	$20.38	$16.34	$14.00

Meter rates per 1,000 gallons: Private plants, 10c to 31c; municipal plants, 7c to 21c; Springfield plant, 6c to 10c.

The average switching charge on a car inside of the city limits is $4.00, on the basis of thirty-ton cars about 13c per ton, and water at 10c per 1,000 gallons is less than 2½c per ton. Therefore, the cost of water delivered at 10c per 1,000 gallons is less than the cost of switching a car on the basis of 2½c per ton.

During the last two years no unfiltered water has been used, and as a result the typhoid fever reduction has been most gratifying. After abandoning the direct use of water from the creek in 1908, there was an immediate reduction of 64 per cent covering 1908, and a further reduction of 30 per cent in 1909 over 1908. Thus it is shown how necessary it is to provide pure and potable supply.

The pumps in every day practice are doing about 80,000,000 foot pounds of work with each 100 pounds of coal consumed.

We are indebted for most of this article and for the photographs to George S. Cotter, the superintendent of the water works.

Handling Coal and Ashes at the Peoria Lighting Plant

REDUCING the cost of labor and minimizing the handling of materials in power plants is becoming more necessary every day and consulting engineers situated in every part of this country are constantly on the alert to adopt the simplest and most practical methods for keeping down the operating cost. The unusual conditions prevailing at the power house of the Peoria Gas and Electric Co., a corporation operating over 4,100 h.p. of boilers, supplying the light and power at Peoria, Ill., necessitated a special type of mechanical equipment for the conveying of their coal directly from the cars to the fires under the boilers and handling the ashes from the ash pits.

The accompanying illustrations comprising a drawing and two photographic views show how this is accomplished, and on account of the limited space we describe only briefly the distinctive features about this mechanical equipment, which was designed to handle 50 tons of either coal or ashes per hour, but as a matter of fact it is frequently handling double that tonnage.

The fuel that is being used is "run-of-mine" coal, which is delivered alongside the plant in 30-ton railway cars. Figure 1 shows a plan and elevation of the entire power house with the equipment in place; it will be seen that the cars may be either dumped into the track pit or unloaded direct from the car by the grab bucket, which is operated by cable and electrically driven double drum hoist situated on the cantilever tower, as will be seen in photograph, figure 2.

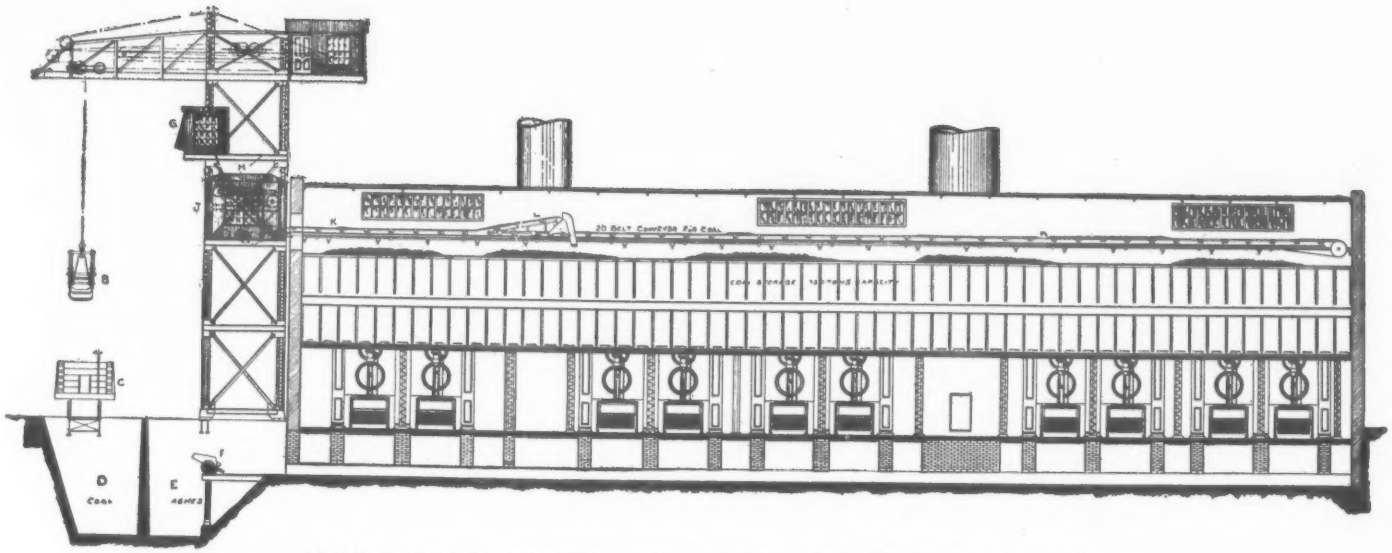
The coal is dumped from the bucket through the receiving hopper placed in the tower to a two-roll crusher, electrically driven. This is accomplished by means of a reciprocating plate feeder equipped with a perforated bottom, which allows the fine coal to by-pass around the crusher, delivering only the large lump coal to the crusher rolls. The coal passing through the rolls is delivered to a belt conveyor, which deposits the crushed coal into the storage bunkers by means of a traveling tripper. The bunkers, having a capacity of over 750 tons of coal storage, are so constructed that they feed the coal directly to the automatic stokers by gravity.

Figure 3 shows a photograph of the belt conveyor house above the bunkers. The conveyor is 225 feet between centers and is 20 feet wide and is 6-ply Jeffrey standard canvas belting. The top strand of this belt is carried on a three-pulley troughing idler; the return strands being carried on two pulley straight face idlers. This conveying belt is equipped with an automatic self-propelling and self-reversing tripper, provided with a brush for cleaning the belt and also a two-way discharge spout for distributing the coal evenly along the storage bunker.

The operator on the tower has his station in the cab and operates two controllers, two clutch levers and one foot lever to handle and control all the movements of the buckets. Windows are provided in the tower to enable the operator to look in all directions. A single laborer is needed part of the time in the car to clean up the coal that cannot be reached by the grab bucket. The bucket will handle nearly every particle of coal, and at no time will more than ¼ ton remain in the car.

The tower is built of structural steel, weighing approximately 65,000 lbs., towering in height 71 ft. The cantilever truss is a trifle over 30 ft. long and is counter-balanced by the machinery house. The method adopted for the removal of the ashes is simple and is explained by referring to the drawing (Figure 1), the ashes coming from the ten fires into the deep steel barrows and being taken to the ash pit, where they are loaded to the railway cars by the grab bucket.

This entire equipment was designed, built and erected by the Jeffrey Manufacturing Company of Columbus, Ohio. The results of the official tests made by the engineers in charge for the Peoria Gas and Electric Co. have also been made known to us and are published here only in a brief way. On May 19, C., P. & St. L. car No. 1125, containing 30 tons of fine coal, was unloaded by the grab bucket in 25 trips, averaging one and two-tenths tons of coal per trip, in less than 25 minutes. The total cost of labor and actual power consumed for the entire 30 tons amounted to less than 40c. The cost per ton for handling the coal for the previous three months ending March 31 showed a total net saving of over 16c per ton, compared with the former methods, when only labor had been used for this same purpose, and the actual saving of over $10,000.00 for the first year with the use of this modern installation.



I. SECTIONAL BRAWING OF POWER HOUSE PEORIA GAS & ELECTRIC CO., PEORIA, ILL.

Water Purification by Ozone

THE utilization of ozone for the purification of water for municipal supply is a familiar development in European countries and in comparison to other purification methods it holds a very favorable position. The authorities of New York City, however, in a recent test and report on the subject found that while the bactericidal value of the process is beyond question, the efficiency, from a mechanical and operative viewpoint, is exceedingly low, inasmuch as practically only 25 per cent of the power required for the operation of the plant was available for the actual production of the ozone, the remaining 75 per cent being required to operate auxiliary units. There are practically no plants of this character in this country and the result of this investigation and report would not be likely to encourage their installation. A recent installation at Lindsay, Ontario, however, on slightly different lines will, in all probability, put a somewhat different light on the subject.

In the European installations electricity is used to produce the ozone almost exclusively. The air is brought into contact with the brush discharge from the high static terminals, with the production of ozonized air. The average ozonizer consists of a rectangular iron box containing a number of plates or smaller boxes, insulated from the containing box and from each other, and connected to a high voltage current. The air after passing through the ozonizer and becoming saturated with ozone is then mixed completely with the water, and as a result the water is purified so rapidly that it can generally be accomplished in the short time that is necessary to free the air from the water. In the European installations an air compressor is used for handling the air and a refrigerating machine for removing the moisture from the air before its entrance into the ozonizers. It was found that the amount of ozone produced in the passage of the air over the electrodes was dependent to a great extent upon the hygrometric condition of the atmosphere, and the refrigerating machine was considered necessary for the efficient production of the ozone for this reason. Chemical dryers have been used with more or less success but the refrigerating machine has taken precedence from an efficiency point of view. The operation of the air compressor and refrigerating machine as auxiliary units is responsible for the low efficiency as noted in the report of the New York City officials mentioned above. The recent installation at Lindsay, Ontario, in accordance with the plans by Mr. J. Howard Bridge, has eliminated these auxiliary units. The refrigerating machine was considered necessary for the removal of the moisture from the air, but in this recent installation the cooling of the air is by water, with a resulting deposition of a portion of the moisture by this process. Again, the air is handled completely throughout its course through the ozonizers and into and through the water by means of hydraulic agencies entirely, the flowing water sucking in the air by means of aspirators, the commingling of the air and water being accomplished in much the same manner as that employed in the Taylor hydraulic air compressor installed at Magog, Quebec, and in a number of other places.

The Bridge development was installed at Lindsay in an attempt to improve the character of the water supply for this place. The water was taken from a lake and swamp and was surcharged with vegetable and animal matter at certain periods of the year to such an extent as to render it most unpalatable and furnish rich nourishment for bacterial development. The total cost of the new installation did not exceed $7,000, with an operating expense per annum of about $300. The amount of water purified was 1,500,000 gallons per day, making the expense approximately fifty-two cents per million gallons. The ozonizers occupy a small brick building 8x10 feet in dimensions, built against the pumphouse of the city station. No air compressor is needed, as the air is handled by the water entirely. The air is drawn through the ozonizers by means of aspirators, which, in turn, draw it into the water in the downflowing stream into a well. From this well it is pumped into the pure water basin. This is the theory of the process, although several modifications have been found advisable. The water rushing into the well is an air compressor of the hydraulic type. This air, under pressure, is then forced through the ozonizers and through another set of aspirators or injectors which carry it into the water in an especially prepared concrete chamber

for ozonization and commingling of the water and air. In the installation in question 4-inch pipes are sunk to a depth of about 30 feet. Into these pipes are inserted small brass tubes connected to the ozonized air chamber. The water rushing down these pipes draws in the air through these small openings and during its fall to the bottom the two materials are mingled. Baffle plates are placed in the upflow pipe to prevent the too rapid separation of the air and water, and at the final egress from this pipe, and with the freeing of the air from the water on settling, the purification is complete.

The ozonizers themselves are comparatively simple in construction. The installation at Lindsay has two ozonizers, consisting of two separate iron boxes, containing twenty-six separate units. Each unit has its own fuse, so that in case of short circuiting the one affected would quietly cease to work with no interference with the remainder. The actual ozonizing mechanism itself consists of a series of plates, connected to alternate currents having a very high voltage. These plates are punched full of small holes with rough edges and the air is drawn over the plates and through the holes in the production of the ozone. The current is obtained from the city mains and goes into the building at about 1040 volts. This voltage is increased by step-up transformers to about 10,000. The two ozonizers are entirely separate and can be operated independently or alone as desired.

The water as it is drawn from the source of supply passes by gravity through a preliminary filter, consisting of a bed of sand three feet thick, into a supply well. This filter is washed out automatically by simply reversing the current and obtaining a supply of water for the purpose from the city mains. This cleansing takes about three minutes on the average and is done daily when the water is very foul. Various arrangements are possible for the operation of the plant. If the water does not require preliminary filtration it can be allowed to flow directly down a well into a subterranean chamber and suck the air If the water power available is at all sufficient the air pressure which rethrough the ozonizers into the water. sults from the separation of the air in the lower chamber will be sufficient to raise the water to a certain height, or the water can be allowed to flow out at a lower level than that of entrance into the well. The air pressure from the subterranean chamber can then be rediverted to the ozonizers, thus increasing the efficiency of their action and producing a complete cycle if desirable. Again, if the hydraulic power is available in addition to the pump, which may or may not be a regular pumping unit, the air, without going through the ozonizers, may be drawn into the current and compressed into the subterranean air chamber. It can then be allowed to go through the ozonizers under pressure and be forced into the water at any point in its further progress and kept there as long as desired. In the particular plant in question the water passes entirely by gravity from the river, through the filter and sterilizing well, to the suction pipe of the pumps. From this the water is forced through the ozonizing chambers and down the 4-inch pipes leading to the bottom of the well. The same pumps can be used for the alternate duty of pumping into the pure water basin through the system and then into the stand-pipe. As can be readily seen, a number of modifications of this type are possible. On egress from the delivery pipe the water is clear, bright and free from disagreeable taste or smell, and is also practically free from noxious germs.

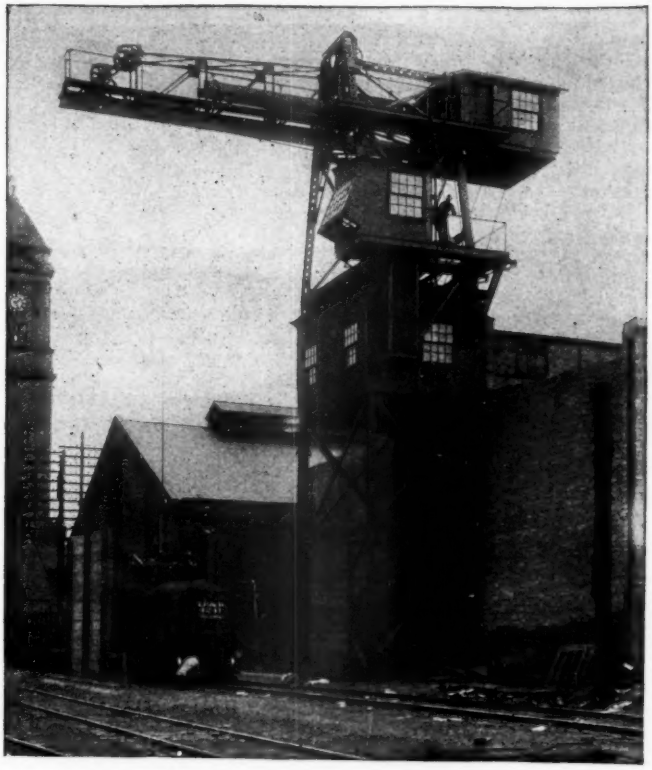
The low first cost of such a plant and the low operating expense puts it within the reach of small communities which have heretofore not considered the installation of an ozone purification plant, because of its high original cost.

This development is also of special interest to small electric power plants in the installation of electric current in connection with the water works system. Practically no water works plant is too small to install such a system, and while the current consumption is not large, it is absolutely continuous, and a successful working out of the plant at Lindsay would no doubt result in giving an added impetus to the subject.

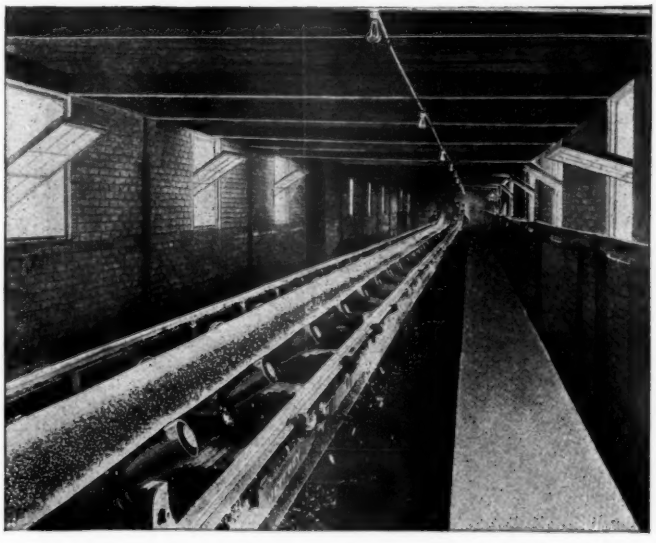
The above description of the Lindsay plant and its principles was supplied by Joseph H. Hart, Ph. D., contracting engineer, of Cincinnati, O.

The following data regarding the operation of the plant are taken from various reports and indicate that its method of operation is not yet thoroughly standardized:

A test of the purification plant in the summer of 1909 by a bacteriologist of Toronto University showed that the filters removed 75 per cent. of the bacteria in the raw water and the ozone treatment removed 85 per cent. of the



II. HOISTING TOWER WITH GRAB BUCKET AND HOPPER AT THE POWER HOUSE OF THE PEORIA GAS AND ELECTRICAL CO., PEORIA, ILL.



III. BELT CONVEYORS DISCHARGING COAL IN THE STORAGE BINS AT THE POWER PLANT OF THE PEORIA GAS AND ELECTRIC COMPANY

remainder, or a total reduction of 96.2 per cent. A three months' test by the provincial board of health in the winter of 1909-10 showed that by chemical examination no purification was demonstrated, and that the filters removed 30 per cent. of the bacteria in the raw water and the ozone treatment 8 per cent. of the remainder, or 35.6 per cent. reduction in all. The difficulty appeared to be that the ozone produced was not efficiently introduced into the water to be purified, so that it did not have an opportunity to perform its office. Whether this is due to inefficiency in operating the plant or incorrect design does not appear from the report, but the difference between the results of the brief summer and longer winter periods of examination would suggest the former.

Some Problems of Grade-Crossing Elimination

THE elimination of a grade crossing can be secured by elevating the railroad above the street or elevating the street above the railroad, or by elevating one part way and depressing the other the remainder to produce the required clearance.

Elevating the railroad above the street ordinarily requires about 17 feet vertical movement, of which 14 feet is headroom for the street and 3 feet is for the depth of the railroad floor and its supports. Elevating the street above the railroad ordinarily requires 25 to 26 feet of vertical movement, of which 22 feet is headroom for the railroad and 3 or 4 feet is for the depth of the floor system of the highway bridge. A railroad can operate with 16 feet headroom, if absolutely necessary, however. And on the other hand electric interurban railways contend for something like 16 feet headroom for their cars and trolley poles and wire hanging devices. According to the nature of the demands, therefore, the relative economy of the elevation of street or railroad may vary from equality to say 33 per cent saving by elevating the railroad.

Mr. H. J. Pfeifer, engineer of maintenance of way of the Terminal Railroad Association of St. Louis, has made a full statement of the problems to be considered in eleminating grade crossings which is as follows:

(a) Effects of Change in Railroad Grade.

These naturally group themselves under the following heads:

First. Probable increase in maximum gradient and its effect on the efficiency of the road.

Second. Effect on railroad improvements, such as depots, water and fuel stations, interlocking plants, switching yards, etc.

Third. Effect on industrial tracks, buildings and other property adjoining the railroad right-of-way. The last two items are sometimes of serious import as a material change in grade may involve the almost complete destruction of improvements costing large sums of money.

Fourth. Provisions for draining the railroad right-of-way cannot be overlooked and must be given due weight in any plan of grade separation, sometimes at a considerable outlay of money.

Fifth. Damages on account of change in grade on railroad must be paid to anyone who is injured thereby and this item, on account of the amount that may be involved, cannot be passed over without proper consideration.

Sixth. The plan proposed for the crossing under consideration may seriously affect a proper solution for adjoining crossings which makes it necessary at times to consider a series of crossings as a unit. Failure to do this may be disastrous in its results to all concerned.

Seventh. Grade separation on the existing right-of-way may involve so much expense and such unsatisfactory results that a new line, for which right-of-way must be acquired, is the only solution of the difficulty.

Eighth. Due regard must be had for the future development of the railroad and any plan that would seriously hamper it should not be considered.

Ninth. Care must be exercised so that the railroad will have the proper side and vertical clearance along its tracks and any plan in which this is not attained cannot be approved.

(b) Effects of Change in Street Grades.

First. If the grade of the street is changed, a reasonable gradient must

be secured because if it is too steep, great expense and inconvenience result to those using the street. Opinions differ as to what constitutes a reasonable grade, but I believe I am safe in saying that any slope with less than 4 feet rise in a hundred feet comes within that definition.

Second. Abutting damages on account of change of grade on the street are a prolific source of expense in the abolishing of grade crossings and great care should be taken to avoid them as much as possible.

Third. Right-of-way must be acquired for approaches along the street for the highway structure and great skill can be shown in their proper location and design. These last two items frequently amount to as much as the construction cost, and in some cases makes an otherwise acceptable plan prohibitive in cost.

Fourth. Frequently a proper solution requires a new location for the street. This is the case when, for example, it is found desirable to consolidate two streets and make one crossing serve for both. When it is done with discrimination and good judgment, the results are satisfactory to all.

Fifth. A change in the grade of the street forming the crossing may affect other streets in the vicinity and this condition must be given due weight.

Sixth. Most streets have sewers, water pipes, gas pipes and other ducts under them. Relocation or change of grade of these cannot be lightly passed over as work of this kind runs into money rapidly.

Seventh. The same attention to the details of drainage, future development and clearance given to the railroad right-of-way must be accorded the street, because without a proper regard for these features satisfactory results cannot be obtained.

(c) Form of Structure.

The conditions that have just been outlined, refer to the location of the new crossing and the elements that tend to fix it. After this has been determined upon, or rather, while it is being considered, the form of structure to be used must be devised. If the railroad is placed overhead, a structure must be designed of sufficient capacity to take care of the railroad facilities for which it is required. At the same time, ample space must be left underneath to take care of the street traffic in an acceptable and up-to-date manner. A structure for this purpose usually consists of retaining walls along the building lines of the street upon which rests spans, either of steel or some other form of permanent material. The details of construction will vary according to conditions, such as the importance of the street and railroad, the location, whether in a manufacturing or residence district, and the consequent degree of elegance and ornamentation desired in the work. If the street is placed overhead, a structure must be designed of sufficient capacity to take care of the street traffic for which it is required. Ample space should be left below to meet the requirements of the railroad company. A structure for this class of crossings usually consists of two masonry approaches with steel spans of varying length between, to meet the requirements of the railroad underneath. A structure of this kind is also constructed with varying capacities and ornamentation depending on its importance and on the district within which it is located.

(d) We now come to that feature of the grade crossing problem which is the prime factor in preventing and delaying its solution. This feature is not peculiar to grade crossings, but applies with equal force to a great number of the good things of life. We would all have much that we have not, and do many things that we cannot do, were it not for the fact that the cost of acquiring or doing blocked the way. This cost, when grade crossings are involved, is a serious matter because in some cases the expenditure of over a million dollars for one crossing is necessary and in nearly every case in large cities, an average of a hundred thousand dollars or more is required per crossing. The management of even the richest corporation or the most prosperous city may well study and debate before authorizing expenditures of this magnitude. Yet there are many cases when even such expenditures are justified by the results obtained.

The elements that go to make up this cost may be roughly divided as follows:

Preliminary expenses.
Land and other damages.
Grade changes.
Construction.
Interference with traffic.
Maintenance.
Miscellaneous expenses.

(e) The next phase of this question concerns the division of the cost of the work above outlined. I do not believe that this abstract proposition can

well be controverted or denied, namely, that, where an improvement is required that will benefit a number of interests jointly, equity requires that each pay in proportion to the benefit received by it. That being the case, it is unjust to force one of the parties benefited to pay the entire expense. I contend that the city, or state and city, the railroad and the street railroad, if any, using the crossing, should divide the expense on some equitable and just basis; what that is, I am not prepared to say, except that it should be on the basis of percentages of the entire cost of the work and not along the line of each interest paying for certain special items, such as land damages or special features of construction. The work is a unit and the expense entailed should be treated and divided as such. In arriving at a proper basis for the division of an expense of this nature, knowledge of what is done in other places under similar conditions is of value. I therefore made some investigations of what is being done in nontnher states.

The first I turned to was Massachusetts, as that state has always taken advanced ground in such matters, and through long experience has succeeded in establishing a more equitable regulation and control of its corporations than any other state in the Union. Since 1890, under the control of the Board of Railroad Commissioners, a systematic plan for the abolishing of grade crossings has been carried out, so that at the present time this state is freer from dangerous grade crossings than any other.

Up to June 1, 1907, there was spent in that state for the elimination of grade crossings the sum of $29,221,-380.86, of which total $17,712,709.95 was paid by the railroads, $7,614,070.28 by the state, $3,856,411.69 by the cities and towns, $38,188.94 by the Metropolitan Park Loan Fund. Or, expressed in percentages, the railroads paid approximately 60 per cent, the state 26 per cent and the cities, towns and Metropolitan Park Fund 14 per cent. And I might add that the state of Massachusetts and the city of Boston at the time that the Boston South Terminal Station was built, contributed towards that enterprise the sum of two million dollars for the construction of retaining walls, viaducts and changes in the locations of adjoining streets.

In the state of New York, the control over the elimination of grade crossings rests with the Board of Railroad Commissioners and the percentages of total cost to be paid by all interests are fixed by legislative enactment as follows:

New railroads—railroad pays 100 per cent.

Existing railroads and new streets—railroad pays 50 per cent; city pays 50 per cent.

Existing crossings—railroad pays 50 per cent; state pays 25 per cent; city pays 25 per cent.

Some years ago in the city of Philadelphia, the Philadelphia and Reading Railroad crossed a number of streets from Broad street to Fairmount Park at grade. As this was in the heart of the city the crossings were found to be extremely troublesome and dangerous. Authority was obtained by the city to place a loan of $6,000,000 for the work with the understanding that the railroad company would reimburse the city for half of the cost, in no event, however, was the railroad company to pay more than $3,000,000. The work was carried out and paid for as planned and has been in use for more than ten years.

The Broadway viaduct in East St. Louis was partially reconstructed at an expense of approximately $60,000, after negotiations extending over a period of a few months only; being just about enough time to put the proposition before all of the interested parties. The expense of this work was divided on the basis of 50 per cent to the railroads, 30 per cent to the city and 20 per cent to the street railway company.

To Mr. Pfeifer's statement of the practice in distributing the cost of eliminating grade crossings may be added the Indiana laws. In Indianapolis, according to these laws, the railroad companies pay 75 per cent of the cost of the separation of grades, the city pays 17 per cent and the county 8 per cent, unless there are street railway tracks, in which case the city pays 14 per cent, the county 6 per cent and the street railway company 5 per cent. Not more than $400,-000 can be expended in a year but a contract can be made at one time to cover the expenditures of several years. In cities of the second class the railroads pay 75 per cent of the cost of separation of grades and the city 25 per cent. If there is a street railroad that company pays 10 per cent, which reduces the city's share, with certain limitations as to total amount.

EDITORIAL COMMENT

The Modern Problem of the Road.

Duplication in Activities of Associations.

THE MODERN PROBLEM OF THE ROAD.

There has been an entire change in the statement of the problem of road construction since the advent of the automobile, and sometimes the older forms of traffic have been neglected in making the new formulation of the questions to be answered. Practically, however, the traffic in vehicles drawn by horses has had its full measure of attention. But some of the propositions made to State legislatures regarding legislation have shown too much of the influence of the automobilist, and it is necessary to state more clearly and more frequently the old problem, which is still the most important from the business standpoint, and to make sure that it is not lost sight of in the effort to make improvements for the benefit of the new traffic, which is in the hands of people who know well how to state their case and secure its consideration. When conditions will permit there is no doubt that motor traffic of a more strictly business nature will develop, the development already being fully equal to the opportunities, but there will still remain the animal-drawn vehicle traffic, which must be taken care of.

A discussion of the road problems by experts at a meeting of the Franklin Institute at Philadelphia brings out clearly the demands of the two classes of traffic and the differences in road construction which will result if either class is considered to the exclusion of the other.

The attempt of the road builders of the past has been to make a road surface which will be favorable to the animals driven over it, at the same time that it is durable and as cheap as possible. The earth road when in its state of perfection is the ideal, so far as the animal is concerned, and it is very nearly equal to any other so far as the vehicle is concerned. But heavy travel rapidly turns it to dust; water, beyond light sprinkling, makes mud, and if it remains in the road causes the destruction of the surface, while frost, except in dry climates, very probably makes the road bottomless for a time when it breaks up the soil as it comes out. The best road, when all the above difficulties are considered, has been the macadam road, well drained, well supported so that the soil cannot work to its surface, kept in repair and, where the traffic is heavy, kept sprinkled to lay the dust. This road is harder on the horses, but much less so than pavements, and is better from all the other points of view than the dirt road.

The heavy travel on suburban roads and on through lines and the expense and difficulty of keeping dust down under these conditions have led to many experiments with dust layers, and surface treatments with chemicals, oils and tar have been devised and have been more or less successful. The treatments with heavy asphaltic oils and with tars, especially those refined for the purpose, produce a more durable road, one which is dustless, and, when the best specifications are followed, one which is even more satisfactory to the horses than a plain macadam. Such a road is highly satisfactory for the old traffic and may well be considered the best development in road making if that class of traffic only is to be considered. It would be required only for the main roads and the comparatively slight excess of cost over the common roads could be carried very properly by the State. The county or other authority having the repairs in charge would

benefit from the reduction in that expense.

But this sort of road has been proved by experience to be quite insufficient for the new motor traffic. The reasons for this are very clearly set forth in the discussion above referred to. There was a very good demonstration of the fact at the Indianapolis Motor Speedway last year also. This track was first covered with a bituminous macadam, which was practically the equal of a road which had received the surface treatment referred to. This surface was worn into ruts in every part of the course, and in some places the ruts were worn almost through the layer of tarred macadam. As already stated in MUNICIPAL ENGINEERING, one observer noted that the automobiles on striking a slight inequality in the surface would jump enough to take the weight off of the tires for a distance, which could be computed from an assumed height of obstacle, weight and speed of automobile. During the time of this leap the wheels, relieved of a part of their friction, travel faster than the machine and therefore acted as emery wheels to remove a portion of the surface. This action was so pronounced and the amount of oil used in the first treatment was so small that it was necessary to oil the surface at frequent intervals to keep down the dust raised by the wheels. Where the demands of the race concentrated the traffic the ruts became very serious and the final race was stopped before it was finished. This year the course is covered with a brick pavement, and there has been no such complaint. The new surface has proved to be eminently satisfactory thus far.

The speed of cars exceeded 60 miles an hour frequently. Mr. J. O. Clarke reported, in the discussion above referred to, that there was considerable wear of ordinary macadam roads by automobiles on curves in Valley Forge Park, even when the speed of the machines was restricted to ten miles an hour. He accounts for this by the slip of wheels in turning corners, which is considerable in amount on sharp turns. Open stretches of road which dried out rapidly were also worn by the automobiles, even at the low speed permitted.

Experiences, of which these are exaggerated examples, have led the English to consider special roads built for automobile traffic alone, and have led some counties in Ohio, notably Cuyahoga county, in which Cleveland is situated, to build narrow paved brick roads on one side of the highway, parallel to an earth or gravel or macadam roadway. The horse traffic in good weather prefers the softer road, leaving the brick roadway to automobiles, but can use the harder surface in bad weather or to get around stretches in bad repair.

This is one method of solution of the question and supplies two kinds of road to keep up—the soft road, which must be kept in condition for traffic in good weather, at least, and the hard road, which, if well made of good material, should require but little attention, if mainly used by automobiles, for their soft tires have little or no effect upon it.

Another method of meeting the difficulties which has several points of advantage, is that of making a roadway which will be satisfactory for both kinds of traffic and which must be used by the two in common. The discussion above referred to seems to lead to the conclusion that, at this stage of development at least, the roadway answering these demands best is made by mixing broken stone and prepared tar or other equally good bituminous material according to one of several excellent specifications and laying the mixture in a compacted layer on a properly prepared and drained sub-grade.

Some of the advantages and disadvantages of both methods may be stated to show the nature of the investigation which should be made before any particular system is chosen for use in a given locality or state.

As to cost not much can be said, as the difference between the two methods depends so much upon details that it must be worked out for the particular conditions. Unless one is willing to endure the dust nuisance, it will be

necessary at least to oil the soft roadway alongside the brick pavement so that the dust will not fly in dry weather. For a very heavily traveled road it may well happen that a bituminous macadam roadway of sufficient width would cost as much as a narrow brick pavement and an oiled road alongside, and the brick pavement would be more durable and therefore better, while in other cases the higher cost of the brick pavement would put it out of the consideration.

A brick automobile way would permit rapid travel in good weather with little interference with the slower traffic. The speed might be limited only by the danger in turning corners. The experience with the old Indianapolis Speedway suggests the desirability of limiting the speed on a bituminous macadam highway, even if built much more substantially than that course was built. Then, too, the joint use of the roadway by motor and horse vehicles demands slower speed, at least when the two are on the same stretch of road.

The brick pavement is the only pavement which does not deteriorate when standing without use or with very little use. If not properly laid it may be affected by expansion and contraction more than a bituminous macadam, but it will not change its nature or composition under the action of the weather. Washouts would probably affect the one as much as the other.

The two classes of roadway are developing at the same time, and, in Ohio, almost side by side, so that practical experience will soon give data for a comparison of results.

A more detailed account of the Cuyahoga county, Ohio, brick roads, which the writer has recently inspected, will be given later.

DUPLICATION IN ACTIVITIES OF ASSOCIATIONS.

As a member of the committee on standard specifications of the American Society of Municipal Improvements the writer has had an opportunity during the past month to make some observations on the difficulties which may arise and the waste of effort which may occur on account of duplication of societies in the same field. The above named committee, together with the committee on brick pavements of the Organization for Standardizing Paving Specifications, were the guests of the National Paving Brick Manufacturers' Association on a trip of inspection of brick pavements, good, bad and indifferent, in various Indiana and Ohio cities. Several of those present were members of both organizations, and there was the greatest of harmony among the members of the committees, but nevertheless each committee had its own point of view, its own program of procedure and its own method of arriving at a report. While each is willing to accept the results of the labors of the other, in the intervals between their accidental opportunities for consultation they must proceed independently, and consequently, so far as their fields coincide, with inevitable duplication and possible conflict in ultimate reports, because they act upon different and incomplete information, viewed from different standpoints. This will be still more evident in the work of the sub-committees of the first of the above named societies, which will be appointed to take up the details of the various branches of the work.

If these tendencies are seen under complete harmony of action, how much more evident would they be if antagonisms should arise which would involve the two main organizations. How much more economical of time and effort would it be to thrash out, in the comparative privacy of the committee and association meetings, the differences of opinion which will arise, so that the resulting reports or specifications, when published, will go out with the authority of the united organization. How much more effective will be the campaign of education of city officials and citizens which the labors of these organizations are intended to further, if the engineers agree in principles and as far down the list of details as possible before the reports go to the public.

The younger organization named was called together by the city of Chicago with the primary object of getting together information which the engineers of that city could use as a basis for improvements in its specifications for construction work, and those brought together were so energetic and were so eager in their search for the same information that they joined in the work with enthusiasm.

As already stated, many of those present were also members of the American Society of Municipal Improvements, and it should be easy for them to make the combination which is really necessary if the best interests of the municipal officials engaged in the work of public improvement are to be served.

The new organization was formed for a special purpose and found itself unable to reach its objective point in one convention, claiming that its work thus far is merely preliminary. The second convention will do much to reduce to reasonably permanent form many specifications concerning which there is little or no controversy. It will not, because it can not, take final action upon anything, for future changes in condition will demand future changes, but it will leave open to controversy only details upon which it has been impossible to crystallize practice and upon many of which it will always be impossible to agree.

Really, the Organization for Standardizing Paving Specifications is devoting itself to a field which is covered by a few sub-committees of one of the standing committees of the older organization, and its energy would give the latter needed new life, at the same time that it would itself gain authority by making use of the stability and established position of its elder.

Of the making of new societies there is no end, and when there is complete duplication of field there can be no doubt of the error in the formation of a new one. There can be no question of the desirability of such conferences as that which resulted in the new "Organization, etc.," nor of the second conference called for next January, but that does not justify a new permanent society. Either the new one must expand to fill the field and crowd out the older, must fade away, or be absorbed. There is not room for both.

There is sufficient differentiation between the aims and membership of such societies, for example, as the National Municipal League, the League of American Municipalities, and the American Society of Municipal Improvements, to give some show of justification for their continued separate existence, although they would all be benefited by some closer affiliation than they have at present, but the new organization draws directly from the field of the last of the three, and there is too small a pasture for both. One or both will starve if they try to divide it.

THE QUESTION DEPARTMENT

Cost of Asphalt and Bitulithic Pavements.

Will you please send me the probable costs of paving by the square yard for asphalt pavement and bitulithic pavement. and oblige,

E., ————, Ind.

The cost of asphalt pavements, as determined from recent reports of construction, varies from $1.65 in Kansas City, Mo., to $3.57 in Lorain, O. The cost in Indiana towns varies from $2.13 in Columbus to $2.64 in Auburn. In most of the cases included in the data before the writer the cost per square yard was obtained by dividing the total cost of the street by the total area in yards and includes all items of cost from grading to guarantee. The average cost in about 50 cities is $2.50 a square yard and in four Indiana cities is $2.40, and the cost in the city from which the inquiry comes will approximate very closely these averages. The cost of bitulithic in a dozen cities where reports are at hand varies from $1.48 in Ann Arbor, Mich., to $2.67 in Dallas, Tex., and averages about $2.25. In three cities out of five which have both pavements bitulithic brought the higher price and the average costs for the two pavements reverse the average given above for costs in all the cities reported.

It may be said, therefore, that the average cost of both bitulithic and asphalt for this city will probably be in the vicinity of $2.25 to $2.50 a square yard and that local conditions will probably determine which is the less expensive.

Concrete Blocks for Monument.

I would like opinion as to whether a creditable and enduring monument can be constructed of cement or cement blocks, and as to where we can get plans or cuts of same, the whole cost not to exceed $250. Any information along this line will be greatly appreciated. The monument will be for a soldiers' cemetery and of a general nature, with a tablet of marble or granite for lettering.

D. C. N., Charlevoix, Mich.

Monuments can be made of concrete as durable and probably as handsome as of any other material. Two things are essential: first, an artistic design, made with the express purpose of constructing the monument of concrete in place or of concrete blocks, as may be chosen, and second, first-class, expert workmanship. The monument will not be cheap if these two requisites are met, but it will probably be materially cheaper than a stone monument of equally good design and construction. The monument or the blocks should be made of as wet concrete as possible, such as is used in making so-called cast stone, and special materials should be used on the surface so that when the surface is finished by one of the good methods of making artistic surfaces the material showing after the surface cement has been removed will add to the artistic effect. The book on "How to Use Concrete" ($1) contains instructions for making blocks for making monuments, for making forms for molding ornamental concrete work, etc. This book is written for the cement worker and if one follows its directions without previous experience in the work and without special practice in artistic surface finishes the results may not be entirely satisfactory. A little book on "Practical Concrete Block Making" (50 cents) gives instruction on how to make the blocks for such a monument after they are designed. Houghton's "Ornamental Concrete Without Molds" ($2) and his "Concrete from Sand Molds" ($2) are brief treatises on two other methods of making monuments and blocks with which to build them. The latter gives the method of making cast stone.

Oiling vs. Sprinkling Brick Pavement.

Lebanon has no water system, so we are barred to a certain extent from sprinkling our streets. We have quite a nice and very substantial piece of vitrified brick paved street. The joints are bound and slushed with cement. The brick are very permanent and firm. Some of our business men want to lay the dust by the use of oil. I was afraid it might be detrimental to the road by causing the cement to eventually let loose of the brick. JAS. S. GEDNEY, Mayor,

Lebanon, Ill.

The writer has had no personal experience with this method of keeping down the dust on brick streets. Mineral oils have little or no effect upon concrete, so that it is probable that sprinkling the street with oil would have no objectionable effect upon the structure of the pavement. The queries arise as to whether the odor from the oil will not be as objectionable as the dust, and also as to whether the oily dust will not be a serious nuisance, because it will be thrown by wheels and will stick to shoes and be tracked into stores and houses. The oil will evaporate and must be replaced fre-

quently, so that the process will be rather expensive.

The Studebaker Brothers Manufacturing Co., South Bend, Ind., make a machine for cleaning streets which is easily adapted to sprinkling streets where there is no water supply. It consists of a sprinkler tank on wheels and a gasoline engine driving a pump, which pumps water from the tank and flushes the street by properly directed streams under the pressure produced by the pump. Connections can easily be made so that a suction pipe from the pump can be dropped into a well, cistern or pond and the pump used to fill the tank. The pump can then be used according to the original design of the machine to flush the street, cleaning it at the same time that it is wet down, or an ordinary sprinkling attachment can be put on the tank and be used in the usual way, the only function of the pump in the latter case being to fill the tank. This promises better results than the sprinkling with oil and probably at less expense.

Calcium chloride treatment has been suggested as reducing the number of sprinklings necessary, though not eliminating them entirely.

Can our readers make any suggestions from their experience which will be of interest to our correspondent and to many water carrying some fine material and others in the same condition?

Great Lakes Portland Cement Co.

Can you give me any further information about the Great Lakes Portland Cement Co., which is given in the "Directory of American Cement Industries" as having been formed to purchase the Great Northern Portland cement plant at Marlboro and move it to Charlevoix, Mich?

SUBSCRIBER, ————, Minn.

It is understood that the company referred to is now inactive and letters sent to it are not answered. There is another Great Lakes Portland Cement Co., whose home offices are in St. Louis, and sales office in Chicago, which has been capitalized at $1,500,000 and proposes to build a plant in northern Michigan, but it has no connection with the former company of the same name.

Books on Oil Refining.

Kindly advise where I could obtain technical books pertaining to oil refining.

R. F. S., San Francisco, Cal.

The following are the books on the subject: "Mineral Oils and Their Products," by I. I. Redwood ($6); "Petroleum," a comprehensive treatise by Redwood and Holloway ($13.50); "Petroleum Distillation and Modes of Testing Hydro-Carbons," by A. N. Leet ($2 net); "Destructive Distillation," by E. J. Mills ($2). These books can be supplied by MUNICIPAL ENGINEERING Co. at the prices named.

Re-Design of Supply Main for Larger Water Supply.

A water system having a mile of six-inch pipe on a grade very free from curves and sags, with one hundred fifty feet fall in that mile and a mile of same sized pipe, with twenty feet fall, passing under two rivers, with an eighteen-foot depression under the beds of rivers, desires to obtain a larger flow of water. Should they lay larger sized pipe on the grade commencing at the reservoir, or should they commence at the foot of the grade and lay under the rivers?

Also should they lay pipe on curves or on right angles where they turn corners, and at these corners will it help the flow to use pipe two or four inches larger in diameter for a few lengths of pipe?

WATER WORKS Co., ————, N. Y.

Only a general answer can be given without personal knowledge of all the conditions. To give some idea of the method of computing the problem it may be assumed that a 6-inch pipe 5,000 feet long has a total head at its outlet of 150 feet, and the free discharge from the open end of that pipe would be given by hydraulic diagrams as about 580 gallons a minute. If a 6-inch pipe is assumed with 170 feet total head and 10,000 feet length, the same diagram gives about 420 gallons a minute flow, or a reduction in capacity of nearly 30 per cent. If, now, the first 5,000 feet is assumed to be of 6-inch pipe with a total head of 150 feet and the second 5,000 feet is assumed to be of 8-inch pipe with an additional head of 20 feet, the discharge at the end of the 8-inch pipe would be about 550 gallons a minute, or a reduction in capacity from the first mile of 6-inch pipe of about 5 per cent. A 10-inch pipe on the second mile would have greater capacity than the 6-inch pipe on the first mile. These figures are only for illustration and do not represent the actual state of the case as it would be worked out, because they do not take into account the pressure at which the water must be delivered, any pressure which may come from head of water in the reservoir, the effect of any rises in the pipe above the hydraulic grade line or the draft of water from the main line by branches along the way.

The proper way to attack the problem is to determine the maximum rate at which water is to be delivered, making due allowance for increase in quantity required, the maximum pressure at which it must be delivered, the head at each critical point and the probable losses of head and their location. Then the sizes of pipe can be computed and a proper solution of the problem can be made. Probably the 6-inch pipe was laid without proper attention to the problem in the first place, and it would be well to do any new construction according to a proper plan, even if it is not all done at once. If the water is intended to serve for fire protection a 6-inch supply main gives unsatisfactory service, especially

when of such length as the one under consideration.

Changes in direction of pipe lines should be made in curves, but these curves should be short. Exhaustive experiments indicate that the radius of the curve should be not less than 2½ diameters of the pipe, but should not be much more, say 15 to 18 inches for a 6-inch pipe. Increase in size of pipe at turns would introduce a source of disturbance of flow which would probably produce more obstruction than the plain curve in the 6-inch pipe.

Street Cleaning by Vacuum Process.

As a student of municipal highways affairs, I wish to suggest to your many readers interested in these matters the desirability of cleaning city streets by the vacuum process. No move in this direction has come to my attention to date, but the thing seems to me eminently practical. No doubt large power trucks equipped with suitable mechanism can be designed, and the benefits to be derived from this method of cleaning are many; readily suggesting themselves to any engineer.

Our present methods of sweeping the streets are very expensive, are never successful in gathering the very small particles of trash that are so unpleasant on a windy day, and create a dust in process that is decidedly unpleasant to passersby. An automobile cleaner truck could gather up a full load of the dirt of the streets, haul same to a depot, and be back at work on the streets in a very short period of time.

Trusting that you will call this to the attention of your readers so that some genius of mechanisms may work out an apparatus that will be a real benefit to all city dwelling mankind, I beg to remain, C. A. M., New York City.

The first and long the only street cleaning apparatus using the vacuum process was invented by R. W. Furnas of Indianapolis, Ind., about fifteen years ago. Brief descriptions of its action will be found in MUNICIPAL ENGINEERING, vol. viii, p. 270, and vol. x, p. 131. It covered the ground so completely that there has been no further development until recently. It is understood that a new design of the machine which is automobile, has recently been made and that it will be even more satisfactory than the excellent machine heretofore constructed by Mr. Furnas's company.

Such a machine is in process of development at Muncie, Ind., but is not yet ready for the market. Two patents have recently been granted on machines which do the sweeping by brushes and use an induced current of air or a fan to handle the dust from conveyors from the brushes. One of these, 880,124, was issued to C. H. Butler, Oakland, Cal., and one, 892,260, to Henry A. Huber, Winnipeg, Man.

Mr. Furnas's machine depends on the suction of air by a fan, entirely and is very satisfactory both as a thorough cleaner and as a dust preventer during the process of cleaning.

Assessment of Sewer Costs.

Can you tell me where I can get information regarding the assessment of sewer costs in small towns?

C. D. W., ————, Wash.

A full discussion of the question is given in the March number of MUNICIPAL ENGINEERING, vol. xxxiii, page 191.

Other articles having a bearing on the same question will be found as follows: Vol. ix, p. 242; vol. xii, pp. 105, 154, 184, 372; vol. xiii, pp. 154, 372; vol. xiv, pp. 38, 313; vol. xv, pp. 315, 322; vol. xvii, pp. 32, 33, 97; vol. xviii, pp. 73, 347, 252; vol. xxi, pp. 82, 174; vol. xxiii, p. 168; vol. xxv, pp. 257, 380.

Machinery for Ozonizing Water.

We have received a letter from a firm in St. Petersburg, asking for the names of manufacturers of machinery for ozonizing water. We do not know of any manufacturers of apparatus of this nature, but it occurred to us that you may have some information on the subject, and if so we would greatly appreciate any information that you may give us.

G. C. G., Philadelphia, Pa.

There are several systems of applying ozone to the purification of water and sewage. The de Frise system is in use at St. Maur, Paris, the main office of M. C. de Frise being at 38 Rue du Louvre, Paris. The Vosmaer system is in use in Holland and has been tried with rather indifferent results in America by the United Water Improvement Co., Philadelphia, Pa., which has displaced it by designs made by J. H. Bridge, and has installed several of the Bridge plants. The Siemens system is in use in Germany, installations being made by the Siemens-Halske Co. of Berlin. They have also put in some plants in other countries through their various branches.

The Otto system has been installed in Nice, France, by the Lahmeyer Electrical Co. of London, W. C., England. The Gerard system is developed in America for the Gerard Ozone Process Co. by Westinghouse, Church, Kerr & Co. of New York City. The Steynis system has been built for a private house by the Steynis Ozone Co., 30 Pine street, New York City.

Can Ohio Cities Do Their Own Construction Work?

I would deem it a great favor if you would answer the following questions: Is it possible under the Ohio Code for a city to do its own construction work in cost over $500? and if so, what cities, either in Ohio or other States, are doing so?

S., City Engineer, ————, O.

This is a question for the city attorney, who is presumably familiar with the laws governing his city. Sec. 143 of the Ohio "Municipal Code," passed in 1902, prohibits doing of work or letting of contracts amounting to more than $500 without authorization by the city council, and prescribes that contracts

shall then be let by the proper board or other authority, but gives the city departments no authority to do their own construction work. The writer has no knowledge of any amendment to this section. Numerous cities do more or less work on their own account. Columbus, O., operates it own asphalt repair plant, presumably by special authority. Indianapolis, Ind., cleans its own streets and repairs them, also running its own asphalt plant. Nashville, Tenn., builds its own bitulithic streets. Detroit builds its own asphalt streets, etc.

How to Make Pipe Line Water Tight.

A 6-inch tile water line imbedded in concrete 12 inches by 12 inches was supposed to hold water, but by using coarse material in the construction of the concrete beam the line leaks through the joints and seeps through the concrete. This line was not supposed to be watertight, but was intended to retain water in the line at least half full for 15 minutes. It is now entirely covered and I would like to know if there is any way of treating the inside of the pipe by using swabs with tar or some other material to close up the joints of the pipe. The line is 100 feet long and is open at both ends.

P., ————, Pa.

Can our readers make any suggestions?

It would seem that the swabbing with tar would be sufficient if it were thoroughly done, especially since the lower half of the pipe only is to carry water. Another suggestion is filling the pipe with keeping it so until the seepage of water has carried the fine material into the voids in the concrete surrounding the joints and into the joints themselves. For temporary work corn meal or some such substance has been used, but its organic nature would indicate that it would serve a temporary purpose only. Finely divided clay, chalk or perhaps cement ought to be successful if the line can be thrown out of use long enough to produce the effect.

Is the Long Compass Needle the Most Sensitive?

I note in the article by Charles Lyman Wood, "The Young Engineer and His Working Tools," the statement that a 4½-inch needle is more sensitive than a 6-inch. Is this true? If so, what is the value of the larger needle? I am in the market for transit and want to be guided in selecting the best.

H. A. MORRILL, ————, Neb.

Gurley's "Manual" (50 cents) states that "the test of the delicacy of a magnetic needle is the number of horizontal vibrations which it will make in a certain arc before coming to rest; besides this, most surveyors prefer to see also a quivering motion. This quality, which is manifested more in a horizontal than in a vertical needle, depends upon the near coincidence of the point of suspension with the center of gravity of the needle, and merely serves to show that the cap is unobstructed."

Staley's Gillespie's "Surveying" ($3.50) says that "the principal requisites of a compass-needle are intensity of directive force and susceptibility. Beyond a certain limit, say five inches, no additional power is gained by increasing the length of the needle. On the contrary, longer ones are apt to have their strength diminished by several consecutive poles being formed. Short needles, made very hard, are therefore to be preferred. The needle should not come to rest very quickly. If it does it indicates either that it is weakly magnetized or that the friction on the pivot is great. Its sensitiveness is indicated by the number of vibrations which it makes in a small space before coming to rest." Similar statements are made in Phillips's "Plane Surveying" ($1.50).

The advantage of a long needle is in the increase in space between graduation marks, permitting increase in their number and in the minuteness of vernier readings, but the accuracy of the needle is not sufficient to warrant great refinement in this direction, so that the above named books are justified in their choice of five inches as the maximum length of needle.

Books on Public Parks.

Have you among your publications any work on public parks?

A. S. T., Astoria, Ore.

The following are books on landscape gardening which may contain information applicable to the case:

Repton's "The Art of Landscape Gardening" ($3.22), a new edition, edited by John Nolen.

Parsons' "Landscape Gardening" ($2).

Maynard's "Landscape Gardening" ($1.50).

Lowell's "American Gardens" ($7.50).

Kellaway's "How to Lay Out Suburban Home Grounds" ($2).

Ferre's "American Estates and Gardens" ($10).

Hansen's "What Is a Kindergarten?" ($1.00).

Mero's "American Playgrounds" ($1.70).

The following articles in MUNICIPAL ENGINEERING have bearing on the same subject:

"The Care and Maintenance of Public Parks," vol. xxxiii, page 305.

"Street Openings, New Parks and Boulevards," vol. xxxiii, page 408.

Who Makes Scott Valves?

In response to the inquiry made in MUNICIPAL ENGINEERING, vol. xxxix, p. 36, Jas. F. Brook, C. E., Palestine, Tex., states that the Roe Stephens Manufacturing Co., Detroit, Mich., will on request send catalog of the Scott valves desired.

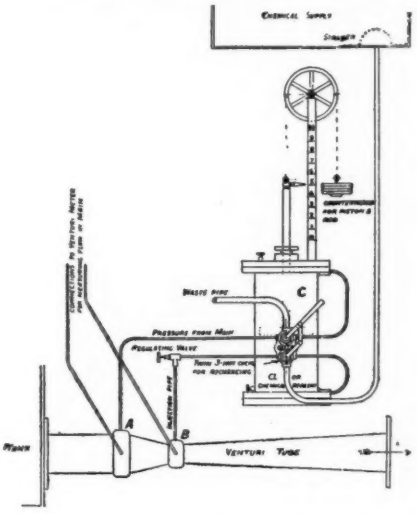
Automatic Regulation of Chemicals with Flow of Liquid.

Is there any apparatus in use for the automatic regulation of the flow of a chemical solution for treating water or sewage so that the flow of the chemical will be proportioned to the flow of the liquid to be treated and will not require constant personal attention?

J., ————, Ind.

The following description of a design for such apparatus made in England is given in a recent number of *Surveying and the Civil Engineer,* published in London:

The apparatus consists of a cylinder C, the top of which is connected by means of a pipe fitted with a three-way cock to the "upstream" end of tube A. A similar connection is made from the bottom of the cylinder to the "throat" B. A piston of the type used in the Kent standard water meters and provided with a



counter-balance weight, works in the cylinder by means of the difference of the pressure on the two sides of the Venturi tube. The chemical solution (e. g., a 5 per cent. solution of chlorine) is supplied to the under side of the piston and the pressure on the upper side of the piston being greater than the pressure on the under side, the chemical is forced down by the piston and injected through the injection tube and regulating valve into the effluent at the "throat" of the Venturi tube. As the flow of the effluent through the Venturi tube produces a difference of pressure which varies as the square root of the velocity, the rate of injection will also vary in the same proportion. The injection is thus in exact proportion to the flow, and any variation of the flow will automatically cause a corresponding variation in the rate of injection.

When the chemical re-agent is exhausted the piston will be at the bottom of the cylinder and the pointer at zero. In order to recharge the cylinder with the chemical the three-way cocks must be reversed by means of the hand-lever, thereby cutting off pipes A and B, and simultaneously connecting the top of the cylinder to the waste pipe, and the bottom to the supply from the chemical storage tank, which is fixed at such a height that the head will rapidly force the piston up and refill the cylinder with the chemical. The three-way valves are then reversed and the apparatus is again in full working order. The apparatus shown is applicable to the treatment of 1,000 gallons per hour, and will only need recharging once per day of twenty-four hours.

A feature of this apparatus is that it is self-starting, and should the flow cease the injection will also automatically stop, the static head on both sides of the piston being equal. There is absolute immunity from danger or over-injection of the chemical by this system, and this is a valuable factor in the treatment of potable water. By means of the indicator the works manager is constantly informed of the exact amount of chemical injected, and the scale readings can be compared with those of a Venturi meter operated by the same Venturi tube. This apparatus can be supplied of a larger size and provided with automatic recharging gear for larger installations.

Use of Sewage for Irrigation at Fresno, Cal.

In connection with the article in the Question Department of the July number, vol. xxxix, p. 38, regarding the disposal of sewage by irrigation, the following regarding the plant at Fresno, Cal., will be of interest as showing the necessity of care in the application of sewage to prevent nuisance. The description is taken from an article by Robert H. Ellithorpe, the inspector of plumbing in Fresno, which appears in *Public Works.*

I will endeavor to describe some of the conditions existing in the system of our sewers in Fresno, Cal., a few years ago and how they are today. Fresno has a population of about 30,000, is the geographical center of the State of California and is situated 209 miles southeast of San Francisco, in the San Joaquin River valley. We have surrounding us a large productive country devoted to fruit-growing and the raising of vegetables and alfalfa. In our country of little rain (so necessary to the proper curing of our crops) we resort to irrigation and give the plant life water whenever it needs it.

Previous to January, 1908, our outfall sewer used to dump the raw material on a ranch about seven miles southwest of the city, the owner of which was paid $150 per month for taking care of it. He used what he wanted for irrigation and left the rest to find a level at any old place it could in his pasture. The condition became so bad that the people in this vicinity united and brought suit against the city for maintaining a nuisance, and proved their case, which was settled by the city putting in the present disposal plant as a part of the present sewer system. Water for irrigation is of great value in the San Joaquin valley, and the water from our sewers is of as much value as its fertilizing qualities. The amount of water flowing to our sewer farm is about 5,032,271 gallons per day.

The utilization of this sewage for the purpose of irrigation without becoming a nuisance governed Mr. Geo. L. Hoxie, the city engineer, in the preparation of the plans of our septic tanks and sewer farm.

A tract of 812 acres of land was purchased and the old outfall extended to it,

and a second 14-inch vitrified outfall was built to provide for the increase in flow from the system.

The outfall is on a grade of 3.3 feet to the mile, and terminates in a redwood box sewer, 2 feet by 4 feet, that extends for 3,100 feet across the farm property. From this box the sewage goes through the oil traps. A considerable amount of oil accidentally is allowed to escape into the sewers from the railroad round-houses, lighting plant and canneries, etc., and it is removed at this point in the system. As much as two barrels have been caught in a day, but this amount is unusual. The trap is 10 feet by 10 feet by 6 feet. From this point the sewage runs along the side of the tank about 30 feet, where it enters the grit chamber, which is 4 feet by 5 feet by 4 feet, and extends from one side of the tank to the other, with a gate at the far side for the purpose of cleansing the chamber. When cleansing this part the sewage runs in an open ditch a short distance to a cross ditch, from which it is distributed onto a sand filter-bed that is sub-drained. This chamber is cleaned twice a week. On each side of the grit chamber are four tanks, 36 feet by 90 feet by 8 feet, built of brick, laid in cement. Each compartment is covered by a roof to exclude light, with a ventilator over each, also one over the grit chamber. The whole tank covers a space 150 feet by 200 feet.

The sewage enters each compartment through three 8-inch by 10-inch Y's, set upright on the floor so as to maintain a depth of 2 feet in the grit chamber, the 8-inch branch extending through the wall to within 1 foot 6 inches of the bottom of the tank. The outlet of each compartment consists of three L-shaped 8-inch pipes, extending to within 2 feet of the bottom, in order to draw off the liquid between the sludge on the bottom and the matt on the top. There is also a flush-gate at the bottom of each compartment for the removal of sludge.

Any tank can be taken out of commission by placing taper plugs or sleeves in the three 10-inch Y's, thus preventing the flow entering this compartment. The outlet pipes discharge over an aerating weir into a box drain along each end of the tanks, from which it is carried to main ditch and distributed about the farm.

At the present time the farm is under municipal supervision, Geo. L. Hoxie, city engineer, having general supervision; B. E. Cronkite, assistant city engineer, being in direct charge.

Last year 240 acres were planted with vines and a like number of acres will be planted with alfalfa and vines this year, and possibly a small tract to eucalyptus trees. This, however, is not considered the best crop for the disposal of sewage, as the trees exclude sunlight and lessen evaporation.

The best crop for this purpose in Fresno is alfalfa, the sewage being applied after each cutting, of which there are five.

Saving Through Owning Concrete Mixers.

Figures compiled from the books of the Aberthaw Construction Company, Boston, Mass., who run ledger accounts for each concrete mixer, showed a saving of about 18 per cent. on the plant cost per yard of material mixed by owning mixers instead of renting them. The mixers in question had been owned from three to seven years and had mixed from 10,000 to 20,000 yards each.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

A Little Bituminous Filler Story.

To the Editor of MUNICIPAL ENGINEERING:

Sir—Three years ago the Department of Public Works of Little Rock decided to make an attempt to avoid the unsightly, wide transverse expansion joint in brick paved streets and to provide, at the same time, for more expansion. We confess we were prejudiced against bituminous fillers and in favor of cement grout. But we have always favored plenty of expansion joints to counteract the cement grout.

On a little district which was being paved by subscription and upon which not enough money could be raised to do a first-class piece of work, the experiment was tried. In the first place the brick were not high grade. They would not stand the National Brick Makers' rattler tests, nor would they stand the absorption test. But they were purchased at a very low figure and we expected the grouting to do the rest.

The pavement was laid on a four-inch concrete foundation, and under the usual specifications. A first-class job of work was done by the contractor and his ce-

ment grout was as well done as is usual on the ordinary brick job.

For the transverse expansion joint, however, we spaced our brick to give one and one-half inches for every one hundred feet in length of street. This made a pretty wide expansion joint, but this amount was deemed necessary on account of the quality of the brick.

The 12-inch strips were placed in the street as the brick were laid, but before pouring the hot filler into this wide joint the three rows of brick either side of the strip were moved inward after the strip was removed, making seven narrow joints to be filled instead of one wide one.

This method has proven a success. It has allowed plenty of expansion and at the same time it has not left a wide, unsightly joint for the bituminous material to expand and contract in, leaving the edges of the border brick unprotected.

But the most valuable lesson taught has been the protection which a bituminous filled affords the brick. The grout filler was well applied and was of good consistency. But as stated the brick were not "number ones." Consequently there has been an excessive abrasion, due to the heavy traffic carried by this small section of street. After three years the brick which have been filled with grout have worn down very considerably, brick and grout together, leaving, however, a fairly smooth street. But every one hundred feet there is a slight ridge in the street from curb to curb. Where the brick have been spread and the bituminous filler used the brick are in almost as good condition as when they were laid, showing very little wear due to the three years' traffic.

A short time since the writer had the privilege of showing representatives of two large bituminous filler concerns over this work and both were astonished (and of course elated) at what they saw. And as strong as our prejudice was against bituminous filler, we must confess that we have seen with our own eyes that where a cement grout has failed to save a soft brick used for paving purposes, the bituminous filler has, after three years' constant wear, so protected the same brick, under the same conditions, that it shows practically no wear. It has been to us an interesting and valuable lesson and we have watched it carefully for a long time. It is given to our fellow engineers now after three years' test that they may, if they choose, profit by our own experience, as we are doing from time to time from experiences of others.

E. A. KINGSLEY, City Engineer,
Little Rock, Ark.

Tanks of Reinforced Concrete.

At Saventhem, Belgium, is a reservoir holding 100,000 gallons of water on eight pillars fifty-five feet high, built of reinforced concrete on the Hennebique system. The foundation is a reinforced concrete ring acting as a unit. The pilars of the tower are joined by reinforced concrete beams, so that it acts as a unit. The slabs, three bays in each space between pillars, are filled in with brick curtain walls with windows in each alternate triplet of bays and a door at the base of one, thus giving plenty of light to the interior of the tower.

At the base of the reservoir is a truncated cone twenty-three feet in diameter at the bottom and thirty-three feet at the top and five feet high. Above this the reservoir is cylindrical, thirty-three feet in diameter and fourteen and one-half feet high. Up through the center of the whole structure extends a cylindrical tower eight feet in exterior diameter, in which are located a winding stairway and the inlet and outlet pipes of the reservoir. This tower extends above the reservoir top, has an ornamental top and opens on an ornamental platform forming part of the cover of the reservoir. The platform is surrounded by a reinforced concrete railing. The decorations are very quiet, but have been carefully studied and their effect is distinctly more pleasing than has been usual in structures of this sort.

Grooved Wooden Block Pavement on Steep Grade.

A portion of James street, Hamilton, Ont., was paved last year with creosoted wooden blocks. On account of the grade these blocks were grooved. The grade is 6 per cent. and is at the head of the main street in the city just before it reaches a high bluff and incline railway. There is a large amount of traffic over this street from two different roads besides the incline railway.

The blocks are laid at right angles to the center line of the street, each block having a groove ½-in. wide and 1-in. deep, the groove being laid at right angles to the center line of the street. The wooden blocks were laid on the flat grade approaching with cement grout, but on the grade asphalt filler was adopted. The crown was laid very flat, rising only about 2-in. in the center. After the first few weeks, when the surplus asphalt filler had been worn off, there were no complaints whatever about the slipperiness of this pavement, and heavily loaded teams go up and down without any difficulty, as the grooves give the caulks of the horses' shoes a firm foothold. The previous pavement was an ordinary macadam, but on account of the amount of water coming down the street from freshets or heavy rainfalls it was unsatisfactory. Mr. Andrew F. Macallum, city engineer, states that since the wooden blocks have been laid they have had no trouble in any way.

Forms of Water Bills—Water Rates.

To the Editor of MUNICIPAL ENGINEERING:

Sir—We notice that you are publishing copies of forms for water rent bill in MUNICIPAL ENGINEERING.

Same should be appreciated by water departments, as we are all looking for information which will enable to lessen our work and keep our records in an up-to-date manner. I enclose copy of form of bill which we are using for flat rate consumers; also copy of our inspectors' card and register sheet which we have found quite convenient. We find that it would have been better to have the street number come first and the name last on the register card and the name first and the street last on the inspectors' card, as in making inspection same is made by streets, while bills are kept alphabetically.

We also enclose a comparative table of water rates which we compiled a few years ago. It will give an approximate idea of the flat rates which are being charged in some of the cities and towns of Connecticut.

S. H. MCKENZIE, Supt.
Southington Water Co., Southington, Conn.

SOUTHINGTON WATER WORKS—Inspectors Card.

Name Ellen V. Ball. No. Marion Ave. Ave

Julia C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves, each Patented 1908. 01727

Service No. / Date Inspected 8/16/07	Families	No. Persons	Kitchen Faucets	Hot Water Boiler	Water Closets	Bath Tubs	Set Bowls	Set Tubs	Hose Connections	Barn Faucets	Horses	Cows	Bar Faucets	Beer Pumps	Urinals	Public Closets	Public Bath Tubs	REMARKS
House	2	5	3	1	1	1	1		1									Closet out of Repair.
Stable																		
Store																		
Office																		
Barber Shop																		
Drug Store																		
Saloons																		
Factory																		

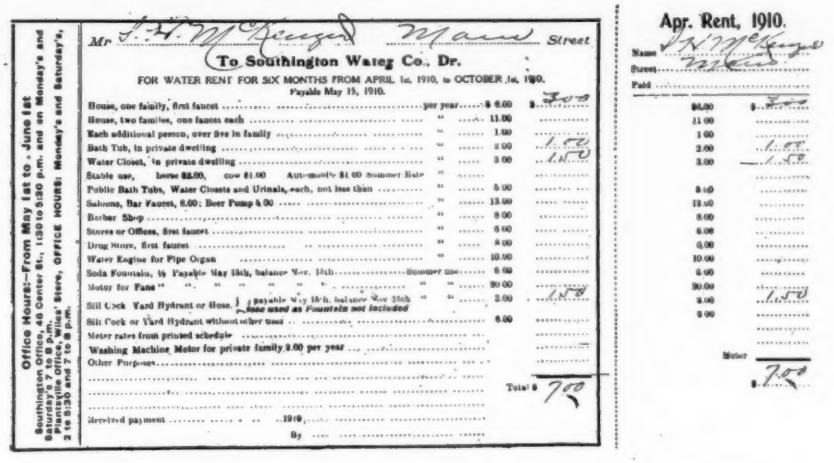
REGISTER-SOUTHINGTON WATER WORKS

No. Street Name

Remarks

Service No. Size Date. Transfers { From Date / To Date

Date of Additions	Rs.				
		Dwelling, one family; 1st faucet	Per year	6.00	Semi-Annual Rate
		" two families, one faucet each	" "	11.00	" " "
		Each additional person, over five in family	" "	1.00	" " "
		Bath Tub, in private dwelling	" "	2.00	" " "
		Water Closet " "	" "	3.00	" " "
		Stable, each horse	" "	2.00	" " "
		" " cow	" "	1.00	" " "
		Public Bath Tubs, Water Closets or Urinals, each not less than	" "	5.00	" " "
		Saloons, Bar Faucet—$ 8.00, Beer Pump—$ 5.00	" "	13.00	" " "
		Barber Shop	" "	8.00	" " "
		Stores or Offices	" "	6.00	" " "
		Water Engine for Pipe Organ	" "	10.00	" " "
		Drug Store	" "	8.00	" " "
		Soda Fountain	Summer use	5.00	" " "
		Water Motor for fans	" "	20.00	" " "
		Sill Cock, Yard Hydrant or Hose	" "	3.00	" " "
		" " " " " without other uses	Minimum rate	6.00	" " "
		Other purposes			
				TOTAL $	



Mr S. H. McKenzie Main Street

To Southington Water Co., Dr.

FOR WATER RENT FOR SIX MONTHS FROM APRIL 1st, 1910, to OCTOBER 1st, 1910.
Payable May 15, 1910.

House, one family, first faucet	per year	$ 6.00	$ 3.00
House, two families, one faucet each	"	11.00	
Each additional person, over five in family	"	1.00	
Bath Tub, in private dwelling	"	3.00	1.50
Water Closet, in private dwelling	"	3.00	1.50
Stable use, horse $2.00, cow $1.00 Automobile $1.00 Summer Rate	"		
Public Bath Tubs, Water Closets and Urinals, each, not less than	"	5.00	
Saloons, Bar Faucet, 6.00; Beer Pump 4.00	"	13.00	
Barber Shop	"	6.00	
Stores or Offices, first faucet	"	6.00	
Drug Store, first faucet	"	8.00	
Water Engine for Pipe Organ	"	10.00	
Soda Fountain, ½ Payable May 15th, balance Nov. 15th	Summer use	6.00	
Motor for Fans " " " " " "	"	20.00	
Bill Cock Yard Hydrant or Hose, ½ payable May 15th, balance Nov 15th	"	2.00	1.00
Bill Cock or Yard Hydrant without other uses (Hose used on Fountain not included)		6.00	
Meter rates from printed schedule			
Washing Machine Motor for private family 2.00 per year			
Other Purposes			
		Total $	7.50

Received payment 1910,

By .....

Office Hours:—From May 1st to June 1st
Southington Office, 46 Center St., 1:30 to 5:30 p.m. and on Monday's and Saturday's, 7 to 8 p.m.
Plantsville Office, Miller' Store, OFFICE HOURS: Monday's and Saturday's, 2 to 5:30 and 7 to 8 p.m.

Apr. Rent, 1910.

Name S. H. McKenzie
Street Main
Paid

$6.00	$ 3.00
11.00	
1.00	
2.00	1.00
3.00	1.50
5.00	
13.00	
6.00	
6.00	
8.00	
10.00	
6.00	
20.00	
2.00	1.00
6.00	
Meter	7.50
	$ 7.50

Comparative Water Rates for Domestic Uses in Connecticut Municipalities.

	Cities	Fam.	Tub.	Set Tub.	Closet.	Hose.	Horse.	Total.
M.	Ansonia	6.00	3.00		3.00	5.00	3.00	20.00
P.	Bridgeport	6.00	5.00		4.00	4.50	6.00	25.50
M.	Danbury	5.00	3.00		3.00	4.00	2.00	17.00
P.	Derby	6.00	3.00		3.00	5.00	2.00	19.00
M.	Meriden	5.00	2.00		3.00	3.00	3.00	16.00
M.	New Britain	5.00	3.50		3.50	3.50	3.00	18.50
P.	New Haven	5.00	3.00		3.00	3.00	3.00	17.00
M.	New London	5.00	2.00		2.00	2.00	5.00	
M.	Norwalk	5.00	3.00		3.00	3.00	2.00	16.00
P.	Putnam	6.00	5.00		5.00	5.00	3.00	24.00
P.	Rockville	5.00	2.00		3.50	3.00	3.00	17.00
M.	So. Norwalk	5.00	3.00		3.00	3 to 5	2.00	17.00
P.	Stamford	6.00	5.00		5.00	5.00	6.00	27.00
M.	Waterbury	5.00	2.00		3.00	3.00	2.00	15.00
M.	Willimantic	6.00	3.00		3.00	3.00	4.00	19.00
	Boroughs.							
M.	Bethel	5.00	5.00		3.00	3.00	2.00	18.00
P.	Branford	10.00	3.00		4.00	6.00	2.00	25.00
P.	Bristol	6.00	3.00		3.00	4.00	3.00	19.00
P.	Danielson	6.00	5.00	3.00	5.00	6.00	3.00	28.00
	Fenwick	8.00	5.00	2.00	5.00	2.00	5.00	27.00
P.	Groton	6.00	5.00	3.00	5.00	6.00	3.00	28.00
P.	Guilford	8.00	5.00	2.00	5.00	5.00		25.00
P.	Jewett City	6.00	4.00		4.00	5.00	4.00	23.00
P.	Litchfield	12.00	5.00		6.00	5.00	2.00	30.00
P.	Naugatuck	6.00	3.00		3.00	4.00	3.00	19.00
P.	Ridgefield	10.00	6.00	5.00	6.00	8.00	8.00	43.00
P.	Shelton	6.00	3.00		3.00	5.00	2.00	19.00
P.	Stafford Spr.	6.00	3.00	2.00	3.00	5.00	4.00	23.00
P.	Stonington	6.00	5.00		5.00	6.00	3.00	25.00
P.	Southington	6.00	2.00		3.00	3.00	2.00	16.00
P.	Torrington	6.00	3.00		3.00	4.00	2.00	18.00
M.	Wallingford	5.00	3.00		3.00	3.00	3.00	17.00
M.	Winsted	5.00	1.00		2.00	5.00	2.00	15.00

Compiled by Southington Water Co. Southington Meter Rates. Large Quantities 8 cts. per 1,000 gals., less 10 per cent. for over $500. per year.
M. Municipal., P. Private.

Points of Value in Catchbasin Construction.

Mr. John W. Stipes of Champaign, Ill., has two devices which enable him to build two 6½-foot catch basins per day. These catch basins are of standard diameter common on street drainage work, with 8-inch walls of brick and cast iron tops, and Mr. Stipes's working force consists of one mason and a helper.

The first of these devices is a mortar board, semi-circular in shape, with the curved side of the radius of the catch basin. To this curved, or back side, is nailed a strip extending up above the surface of the board, so as to prevent any material from being pushed off by the mason's trowel. To this strip are attached four ropes at the quarter points of the semi-circumference, and these ropes are attached to a single rope, which passes over a board thrown across the top of the pit. The whole contrivance may me raised or lowered at will so as to be always in the most convenient position for the mason.

The second device, though very simple in itself, is most valuable as a time-saver. It consists of an arrangement for

lowering bricks into the pit. Six or eight bricks are placed upon two boards, placed far enough apart so that a rope may be placed between them. The rope is then drawn up around the brick and is held tightly in place by an iron hook bent at an angle of about 90 degrees. The bricks are then lowered into the pit and a slight twist of the rope unfastens the hook, allowing the rope to be withdrawn from around the bricks. The value of the latter factor lies in the fact that one helper can keep the mason supplied with both bricks and mortar and entirely without the aid of the mason, who can give his undivided attention to bricklaying.

Cost of Brick Paving in Florida.

To the Editor of MUNICIPAL ENGINEERING:

Sir—Referring to the cost of vitrified brick paving in Florida, I would say that vitrified brick paving recently done here on Central avenue, 60 feet wide, with granite curbing, laid with no foundation other than sand, cost the city $1.54, and was done by contract.

W. T. T., St. Petersburg, Fla.

A Convenient Paving Brick Carrier.

Mr. John W. Stipes, a contractor of Champaign, Ill., has been using a very convenient "home-made" device for handling his brick upon pavement work. The brick, as is usual in most paving work, where such is possible, are delivered upon the site of the work and piled along either side of the street. The usual method of delivering the brick to the layer is to either carry them with hand carriers or to wheel them in wheel-barrows and dump them.

Mr. Stipes's carrier is as follows: He has a continuous series of rollers fastened between two rigid guide braces. These rollers are three inches in diameter, and are held in place by spikes driven through the guide strips and into the ends of the roller. The guide strips or braces are five inches in width, so as to extend on either side of the rollers. The rollers are made to revolve easily and with as little friction as possible.

The method of operation is as follows: One end of the carrier is placed upon a horse at the side of the street and the other rests upon the pavement just laid. One man places the brick upon this carrier allowing them to slide down to the layers. The carriers are usually operated in pairs necessitating four men to handle the brick.

The advantages of the carrier lie in the fact that the brick are delivered just as needed; they are not chipped and broken by being dumped from a wheel-barrow; the dirt incident to running a wheel-barrow on and off the pavement is obviated (a big factor where the pavement is to be grout or asphalt filled); and only four men are needed to handle the brick, where five or six are needed in the wheel-barrow or hand methods.

Mr. Stipes also employes the carriers in unloading brick from cars and in delivering brick and fireproofing into buildings.

Calcium Chloride and Its Action on Road Surfaces.

From a report of a successful test of calcium chloride as a preventer of dust on country roads, made in England, a description of the chemical and of the nature of its action on the dust in a road is abstracted below. It will be noted that a rather humid atmosphere is necessary for complete success in the operation and therefore it may be expected that in many parts of this country and for periods of each year, which may sometimes be quite prolonged, the humidity will be so low that the virtue of the calcium chloride will be temporarily lost by the lack of moisture to absorb from the air. This may be overcome to some extent by occasional sprinklings. It may also be remarked that heavy rains are more frequent in this country than in England and that on this account the calcium chloride will be more completely and more frequently washed out of the surface, so that renewals will be necessary at more frequent intervals. It is very probable, therefore, that there are but few localities in this country in which this chemical will prove as satisfactory as it has in England. Following is the extract from the report of the test:

Calcium chloride is produced in large quantities as a by-product in the ammonia-soda process of manufacturing common washing soda and in certain other chemical processes. It may be obtained in a number of forms varying in composition only according to the amount of water contained therein. For instance, the common crystals of calcium chloride contain about 50 per cent. of water and 50 per cent. of true calcium chloride. Another fairly defined modification contains about 76 per cent. of calcium chloride and 24 per cent. of water. By strong heating it may be obtained free from water. In all these, and in intermediate states, it has the property in a marked degree of absorbing moisture from the surrounding atmosphere, and if left exposed to damp air it eventually becomes a thick, syrupy liquid through the absorption of moisture. If it is then exposed to a dry atmosphere it will gradually part with some of this moisture and reabsorb moisture when again exposed to a moist atmosphere. It is on this property of absorbing large quantities of moisture that the utility of calcium chloride for laying dust on roads depends. The salt for the "dry" method of treatment was in a granulated form and contained about 70 per cent. of true calcium chloride and 30 per cent. of water. The effect of spreading this salt on the road is that it rapidly absorbs moisture from the atmosphere, the granules thus soon becoming soft, moist globules, which ultimately liquefy by further absorption of moisture and are then absorbed in the pores or interstices of the road surfacing material. The syrupy nature of the liquid which

results from calcium chloride by the absorption of water hinders its removal from the road material by washing due to rainfall, though ultimately prolonged wet weather must result in the extraction of nearly the whole of the salt from the material. The trials demonstrated, however, that even in very favorable conditions for the removal of the salt from the road material by rain an appreciable amount was retained for several weeks.

When absorbed in the pores and interstices of the road the calcium chloride takes up or gives off moisture according to the degree of humidity of the atmosphere at the time. Thus on a dry, hot day it will tend to become dryer, but will never in the conditions in this country pass beyond a certain stage in which it is still a syrupy substance, having more or less binding action due to its viscosity on the road material in which it has been absorbed. On the other hand, when the humidity of the atmosphere is increased, as is commonly the case at nightfall in this country, even on dry days, the calcium chloride absorbed in the road will take up moisture from the atmosphere and thereby render the road material moister than before. Thus in summer weather the effect of the treatment of a road surface with calcium chloride is to provide the material of the road with an ingredient which keeps it in a slightly damp conditon by absorption of moisture from the atmosphere. Even in the dryest and hottest weather the road cannot become absolutely dry, and any dust or small particles which are picked up from it must, owing to the heavy syrupy solution of calcium chloride incorporated with them, be disinclined to break up into small, fine particles which would be carried or held in suspension for any appreciable time in the atmosphere. Consequently any dust which may be raised from a road treated with calcium chloride is of a denser and less finely divided description and so falls to the ground more rapidly. Calcium chloride is a body without any pronounced toxic or corrosive properties. By its solution in water the temperature of the water is considerably reduced for the time being, and a solution of calcium chloride in water freezes at a considerably lower temperature, depending on the amount of salt in the solution, than pure water.

MUNICIPAL MATTERS IN COURT

Higher Courts—Pennsylvania Courts—Michigan City Paving—Tennessee Front Foot Law—Denver Civic Center—Sewer Contractor vs. Water Pipes—Plymouth's New Bridge—Nebraska Paving Law—North Platte Water Works

Decisions of the Higher Courts of Interest to Municipalities.

City Engineer—Streets—Boundaries.—Where, in mandamus by a property owner to compel a city engineer to ascertain and disclose the location of the street line in front of her property, the city engineer on the trial admitted that he had refused to disclose the true line based on data, which he deemed controlling, or any other line than that claimed by the city authorities, admittedly contrary to his own conclusions on the subject, the court was authorized to terminate the hearing at that point and award a peremptory writ requiring the ascertainment and disclosure of the true line as required by the ordinance. A city was not a necessary party to mandamus against a city engineer to compel him to ascertain and disclose to relator the true line of a street under an ordinance declaring that every person contemplating the building of houses, walls, or fences, before doing so, shall have the line or lines of the lots running on the street established by the city surveyor, and for violation thereof shall be subject to a fine.—Giraud, City Engineer, v. Winslow (Tex.) 127 S. W. 1180.

Municipal Indebtedness.—An agreement by a village to pay a specified sum annually for arc lights during a specified period constitutes an indebtedness for the whole amount, and is illegal if exceeding the constitutional limit.—Evans et al. v. Holman et al. (Ill.) 91 N. E. 723.

Public Works—Contracts—Authority of Officers—Fixing of Salary—Greater New York Charter (Laws 1897, c. 378), sec. 455, authorizing the commissioner of bridges, when thereto authorized by the board of estimate and apportionment and board of aldermen, to employ a consulting engineer skilled in bridge construction, and Laws 1897, c. 665, providing for the establishment of a public drive and parkway as an extension of Riverside Drive, did not authorize the commissioner of highways to contract with an engineer to furnish plans and specifications for the drive and superintend a part of the work for compensation based upon a percentage of the cost, until such plans and specifications were approved by the board of esti-

mate and apportionment, and such contract was not the fixing of the salary of a consulting engineer.—Hildreth v. City of New York (N. Y.) 122 N. Y. S. 1054.

Specific Performance — Conveyance of Waterworks System—Alternative Relief. —In an action to specifically enforce a contract for the construction of a waterworks system and compel a conveyance to the city of the system and determine what amount the city should pay therefor, a decree determining that there should be deducted from the price agreed on the cost of establishing sewage disposal works, so as to prevent contamination of a river, which contamination had been contracted against, and then modifying such provision by giving the waterworks company leave to present a plan for preventing the pollution of the river which would be less expensive, and if found good the cost of that plan to be deducted from the contract price, is fair and just, and affords no ground for criticism.—Mayor, etc., of Jersey City v. Jersey City Water Supply Co. (N. J.), 76 A. 3.

Defective Streets—Liability.—Where an excavation in a street for sewer and water connections was made by a plumber employed by the abutting owner in pursuance of permission granted by the city department of public works, and under the control of the city engineer, and subject to a penalty for failure to restore the street to its former condition, the city was a joint actor with the owner in making the excavation, and was liable for failure to restore the street to its former condition.—Tabor v. City of Buffalo (N. Y.) 120 N. Y. 1089.

Paving Contracts—Extras.—Within a contract for paving a street with asphalt, exacting the laying of concrete on the old foundation of a wooden block pavement to bring the surface to subgrade before the laying of the asphalt, and providing that there should be no compensation for "extras," the laying of the concrete, an essential portion of the work, for which separate bids had been taken, is not an extra.—Fullerton et al. v. City of Des Moines et al. (Ia.) 126 N. W. 159.

Street Improvements — Advertisements for Proposals.—The advertisement for proposals, where a wooden block pavement laid on a concrete foundation was to be succeeded by an asphalt pavement on the same foundation, stating that the asphalt was to be laid "on the present cement concrete foundation," that the improvements were to be "as per the plans and specifications," which required the old foundation to be brought to subgrade, that the new concrete necessary for resurfacing said foundation "be measured in boxes * * * satisfactory to the city engineer or in any manner he may direct," and that separate bids be made for "asphalt paving on old concrete foundation," and "for extra concrete per cubic yard," sufficiently shows that the "extra concrete" is to be placed on the old foundation in bringing it to subgrade.—Fullerton et al. v. City of Des Moines (Ia.) 126 N. W. 159.

Indebtedness—Issuance of Bond—Necessary Expense.—The protection of a town from fire and disease by providing water and sewerage is a "necessary expense," within the meaning of Const. art. 7, sec. 7, and Revisal 1905, sec. 2974, providing that no muncipal corporation shall contract any debt, pledge its faith, or loan its credit, nor shall any tax be levied or collected by any officers of the same except for the necessary expenses thereof, unless by a vote of the majority of the qualified voters, therein, and, therefore, a vote of the people is not required to render bonds issued to provide waterworks and a sewerage system valid, in the absence of statutory restriction enacted under Const. art. 8, sec. 4, making it the duty of the Legislature to restrict the power of cities to tax, borrow money, contract debts, or loan their credit.—Underwood v. Town of Asheboro (N. C.) 68 S. E. 147.

Street Improvements—Action for Cost—Limitations.—Act April 19, 1890 (Acts 1889-90, c. 902), amending Lexington city charter, provides that the cost of a street improvement shall be borne two-thirds by the owner of abutting property, and one-third by the city, unless he requests the adoption of the "ten-year plan," in which event he pays the whole cost in installments, for which the city issues bonds and pays interest thereon. *Held*, That in absence of request therefor, the adoption of such ten-year plan did not extend the limitation period beyond five years from completion and acceptance of the work, and the city's cause of action under such act was barred in five years from its accrual, pursuant to Ky. St. 1903, sec. 2515, barring in that time liability to pay for street improvements.—City of Lexington v. Woolfolk (Ky.) 128 S. W. 104.

Duty of City to Prevent Obstruction.—It is the duty of a city to so construct and maintain its sewer drains as to prevent clogging with sewage to the annoyance and damage of property owners. Where the complaint, in an action against a city for a nuisance from allowing the outlet of a sewer to become clogged, alleges that the sewage empties into an open ditch, rendering plaintiff's lots less desirable for building purposes, and that the overflow from the ditch carries offensive matter on the lots, and renders them worthless for garden purposes, to plaintiff's damage in a specified amount, it sufficiently shows injury to plaintiff.—Cannelton v. Bush (Ind.) 91 N. E. 359.

Compelling Performance of Official Duty.—The charter of a municipality conferred upon it the power "to own, use, and operate, for municipal purposes and for profit, a system of waterworks and electric lights, to make rules and regulations regarding the use of the same by the pub-

lic, and to provide by ordinance for the punishment of those who illegally use said water or light. A resident filed a petition for mandamus to compel the municipal authorities to supply water at her residence. It was alleged that the municipality had established a water system, with which the applicant's residence was connected, and was serving the public generally, but without cause had stopped applicant's supply of water and refused to serve her, although she was due nothing for water rent, and tender of payment in advance was made for the service desired. *Held,* That the petition was not subject to dismissal on the ground that the plaintiff had a specific legal remedy. Camilla v. Norris (Ga.) 67 S. W. 940.

Three Mile Law Constitutional.—Burns' Ann. St. 1908, sec. 7712, authorizing a petition by freeholders of any township including any incorporated city or town having a population less than 30,000, for the improvement of highways therein, is not unconstitutional as class legislation because it only applies to townships in which are cities or incorporated towns having 30,000, or less, population. All public highways are "state highways," and the state is the sole arbiter of the manner and conditions of their improvement, except as limited by the Constitution. Burns' Ann. St. 1908, sec. 7719, providing that, where the road proposed to be improved is less than three miles in length, connected at each end with an improved road, or connecting an improved road with a boundary of the township, etc., the commissioners may authorize the improvement without submitting the question to an election of the voters, and providing generally for elections, is not unconstitutional as discriminative in favor of roads less than three miles long, and in favor of roads having certain termini, etc.—Cummins v. Perce et al. (Ind.) 91 N. W. 529.

Contracts—Notice for Bids—Validity. —Seattle City Charter, art. 6, sec. 14, provides that, before letting a city contract, the board of public works shall cause a notice to be published, inviting sealed proposals, "the plans and specifications whereof must, at the time, be on file in the office of the secretary of the board, subject to public inspection." *Held,* That where the equipment of an automatic fire alarm central office for a city, as designed by the city electrician, was authorized by ordinance, a subsequent notice to bidders, after a call for bids had been published, which abrogates the specifications, and establishes in lieu thereof an equipment which the board and city electrician may deem adequate, renders the bids for the contract and all subsequent proceedings void. Resident taxpayers may maintain a suit to restrain a city and its board of public works from the execution of an illegal city contract, though an unsuccessful bidder for the contract caused the suit to be commenced, and will defray the expenses thereof.—Goshert et al. v. Seattle et al. (Wash.) 107 Pac. 860.

Public Water Supply—Rights—Discrimination.—An incorporated water works company, being a quasi public corporation, cannot make a discriminatory rate for or against its customers. In a suit to enjoin a water works company from shutting off the water supply from a state institution located within the village unless it paid a 20-cent rate claimed to be discriminatory, an allegation of the answer that the 12-cent rate to which the state institution claimed to be entitled was made for the inhabitants of the village for the reason that defendant's contract to furnish water to the village for fire protection for a certain sum annually required that the water be furnished to the inhabitants of the village at that rate did not allege that the sum named, plus the 12-cent rate, aproximately equaled the rate demanded of the state institution so as to constitute a defense to the suit. —People v. Albion Water Works Co. (N. Y.) 121 N. Y. 660.

Construction of Sidewalk—Exercise of Police Power.—A city can construct a sidewalk and charge the expense against the adjacent lot under the exercise of the police power and regardless of benefits. Acceptance of a walk by a city is not binding on a lot owner where it would operate as a fraud on him. A complaint to set aside a sidewalk assessment alleging that as constructed it was practically worthless set forth a fact which showed a legal fraud perpetrated on plaintiff, and stated a cause of action. In a suit to set aside a sidewalk assessment because the walk was practically worthless, the contractor who was paid for the work was a proper, but not a necessary, party; defendant city being the owner of the improvement certificate.—Eiermann v. City of Milwaukee et al. (Wis.) 126 N. W. 53.

Reconstruction of Sidewalks — Rights of Abutting Owners.—The Milwaukee city charter (Comp. 1905, c. 7, sec. 17) provides that the board of public works may by resolution declare any sidewalk to be dangerous, when in its judgment it is so, and may order it repaired or relaid, and employ any person to do so at a fair price, and by special assessment charge the expense of the abutting land, and such an assessment is made a lien against such adjacent property without any estimate, notice, letting, or other preliminary proceeding except the resolution. *Held,* That the sole protection given the landowner thereby was that the walk must be repaired or relaid "at a fair price."—Eiermann v. City of Milwaukee et al. (Wis.) 126 N. W. 53.

City Water Works—Negligence—Liability—Where a city, operating a system of water works furnishing water to its citi-

zens, controlled the cock at the junction of service pipes and the main pipe, by which water was let on and off, it must remove an obstruction therein within a reasonable time, and where it failed to do so it was liable for injuries sustained by one by reason of an nsufficient water supply. Where a city failed to remove an obstruction in its system of water works, whereby a citizen was deprived of water for domestic purposes, the damages sustained were not limited to actual money losses; but he was entitled in addition thereto to compensation for the trouble and inconvenience suffered by being deprived of water.—City of Jackson v. Anderson (Miss.) 51 S. 896.

Water Supply — Contracts—Acceptance of Offer.—Five days before the expiration of a five-year contract between a railroad company and a public water company, the manager of the water company wrote the railroad superintendent that he could no longer furnish water at the former rate. The superintendent did not reply, and in two days after the expiration of the contract the manager wrote again, stating that at the expiration of the contract he had comenced to charge the railroad at the advanced rate. Eight days after receipt of the second letter, another official of the railroad replied, refusing to make a contract. *Held,* That the railroad company's silence for eight days after receiving the water company's proposition, and the acceptance of water after the expiration of the first contract and whie the water company's proposition was pending, and payment made for the water at the higher price, was not an acceptance of the offer, so as to form a contract for another five years at the advanced price, especially as the water company was a public service company, and under its charter bound to furnish water to the railroad company when properly compensated therefor.—Vicksburg Water Works Co. v. Yazoo & M. V. R. Co. (Miss.) 51 S. 915.

Water Works—What Constitutes.—One who obtained from a city a franchise authorizing him to sink an artesian well to supply water to the public therefrom for pay, through mains and pipes which he was authorized to lay over certain streets in a particular part of the city, was conducting a system of "water works," within Code 1906, sec. 3886, imposing an annual privilege tax on water works in cities; the fact that the water supply is an artesian well not making the business taxable as an artesian well, instead of a water works, where the main purpose of the well is to conduct a water works business, and is not merely incidental to its use by the owner.—Randall v. Smith, Tax Collector (Miss.) 51 S. 917.

Extent of Municipal Ownership—Public Use.—A city, taking land for widening a highway, may not, in connection therewith, take additional land, with a view to a subsequent sale thereof at full value, though the taking of the additional land is necessary to promote adequately the commercial and industrial welfare of the city, such an enterprise not being a public use, within the Constitution, and it is immaterial that public funds are not to be used for the construction of buildings on the additional land. A city may not take land outside a public work for speculative purposes, but there may be such a remnant of an estate, a part of which is necessarily taken, so small, or of such a shape, and of so little value, that the taking of it in the interest of economy or utility may be fairly incidental and reasonably necessary in connection with the taking of land for the public work.—In re Opinion of the Justices (Mass.) 91 N. W. 578.

Public Improvements—Lien for Materials.—One furnishing materials to a subcontractor of a city contractor, who has sublet part of the work by a contract giving the subcontractor no right to look to the city for pay, is not within Laws 1882, p. 866, c. 261, giving materialmen a lien on money due from the city to the contractor or his assigns.—Milwaukee Lumber Co. v. City of Milwaukee (Wis.) 123 N. W. 653.

Measurement of Sewer.—A contractor for city sewers, who was paid for constructing manholes, could not in measuring the length of the foundation under the sewer measure from center of manhole to center of manhole, for to do so he would be paid twice for the same work.—Shea v. Sewerage & Water Board of New Orleans (La.) 50 S. 166.

Municipal Indebtedness—Constitutional Limitations—Right of Taxpayers.—Where a village acquired an electric light plant for $11,496, by issuing $4,200 of bonds, which was the constitutional limit of indebtedness, subject to the payment of a mortgage indebtedness on the plant of $7,296, as it matured, and taxpayers made no objection to the purchase of the plant nor to the insuance of the bonds by the vendor, but merely sought to prevent the payment of any price above $4,200, and the officers of the village insisted that the transaction was legal and that the income of the plant would pay for itself, the court could only enjoin the payment of the mortgage indebtedness except out of the net income of the plant after paying operating expenses and necessary repairs. A municipality does not create an indebtedness by obtaining property to be paid for wholly out of the income thereof.—Evans et al. v. Holman et al. (Ill.) 31 N. E. 723.

Damages or Penalty.—The holders of a city gas franchise, in consideration of an extension of time within which they were required to equip their plant and place themselves in readiness to furnish gas, executed a bond by which they agreed to pay the city $1,000, on condi-

tion of their failure, within the time as extended, to have gas piped to the city and be in a position to supply gas, such amount to be payable to the city on April 26, 1909, unless gas should be supplied as provided. The ordinance extending the time required that the bond should be executed, and that the penalty thereof should be considered as liquidated damages. Held, that the amount so provided for should be regarded as liquidated damages, and not a penalty, and that on failure of the franchiseholders to perform they and their surety were liable to the city on the bond without proof of actual damages.—City of Marshal v. J. W. W. S. Atkins et al., (Tex.) 127 S. W. 1148.

Paving.—Municipal Contract.—A taxpayer has the right to come into court to enjoin the execution of a paving contract, which has been adjudicated without affording opportunity for competition, unless the property holders, by their petition, fix the price for a patented pavement, or a pavement containing a proprietary ingredient.—Saxon v. City of New Orleans, (La.) 50 S. 663.

Municipal Water Company—Insufficient Fire Protection—Suit for Loss—Liability.—A city in contracting with a water company for fire protection represents its inhabitants, and contracts for their benefit, and one who suffered a loss by the company's default was the real party in interest in a suit by him therefor, and was not bound by the testimony of the fire department that the water pressure was all right; and hence a motion for a peremptory instruction for defendant, based on such testimony, was properly overruled. A water company, under contract to maintain a certain pressure in its mains for fire protection, need not do so till it has notice of a fire, but is then bound to put it on, and it is not liable unless it fails to comply with its contract, and its failure is the proximate cause of loss.—Georgetown Water, Gas, Electric and Power Co. v. Neale, (Ky.) 125 S. W. 293.

Municipal Matters in Pennsylvania Courts—Cases of Interest from the "Municipal Law Reporter."

Damages for Defects in Sidewalk—Contributory Negligence.—The plaintiff was injured by stepping on a loose gutter grate in the city of Lancaster. It was shown that the plate was not so fastened as to be kept in place; that for a long enough time to show constructive notice to the city it was frequently loose. *Held,* that the plaintiff was guilty of contributory negligence and that the city of Lancaster was not liable for damages.—Clark v. City of Lancaster (Pa.), vol. 1, 229.

Damages for Excessive Slope of Sidewalk—Contributory Negligence.—Plaintiff in seeking to pass two ladies on the sidewalk, slipped and fell, sustaining injuries for which he asked damages. The sidewalk was 10 feet 6 inches wide. From the house line to the center it sloped 1 inch toward the gutter. In the next 2 feet 8 inches the slope was 4 inches, and in the next 2 feet 8 inches the slope was 8 inches. *Held,* that his injury was due to contributory negligence and not to the excessive slope of the walk, as the plaintiff testified that he had seen that there was a heavy grade.—Stitzel v. Marietta Borough (Pa.), vol. 1, 239.

Sewer Drops and Sub-Drain as Part of Cost of Grading, Paving and Curbing.—It was held that the changing of sewer drops and sub-drains incident to the construction of grading, curbing and paving was essentially a part of the cost of the grading of the street and was made for the benefit of the street entirely.—In re Improvement of Jackson Street (Pa.), vol. 1, 244.

What Constitutes Dedication.—The mere dedication on the part of owners does not of itself make the streets and alleys of a plan public highways. The additional requirements that the plans must be approved by the council and recorded must be fulfilled before the streets and alleys may become public highways. The approval of the council is to a certain extent obligatory upon the council unless there is good reason why a plan should not be approved. In re Improvement of Jackson Street (Pa.), vol. 1, 245.

Roadbed of Railroad Not Liable to Assessment for Local Assessment on Municipal Claims.—The roadbed of a public railroad is not "real estate" within the meaning of the act of June 4, 1901, P. L. 364, and is not subject to assessment for local taxation nor municipal claims.—Philadelphia to Use, Appellant, v. Fairhill Railroad Co. (Pa.), vol. 1, 148.

Act of May 6, 1909, P. L. 441. Providing for Recovery of Moneys, Labor and Materials Furnished by Sub-Contractors for Municipal Improvements Is Unconstitutional.—The act in question provides that a sub-contractor may file a lien at any time before an improvement or work is completed. Such a claim shall be a lien for the principal and interest of the value or agreed price of such labor or materials applicable to the construction of such improvement. The act was held unconstitutional in that it provided for a limited class of persons a special remedy for the securing and recovering of a particular kind of debt due this limited class of creditors.—Ley Construction Co. vs. County of Allegheny (Pa.), vol. 1, 276.

A Street Railway Company Must Keep a Street in Good Repair.—Opinion by Holt, P. J., holds that a street railway company, under its franchise, may be compelled to keep a street in good repair.

The bill requires specific performance.—Rochester v. Street Railway Company (Pa.), vol. 1, 281.

Paving and Grading—Assessment, Manner of Levying by Viewers.—The courts may pass upon the legality of an assessment, which is a form of taxation; but they have no authority to levy such an assessment nor to pass upon the values of property nor the extent to which such property is benefited. Where viewers make a report and it appears from the report that the special benefits are in exact proportion to the extent of the frontage of the property, such a result is not illegal simply because it might have resulted from the use of the front foot rule.—Walnut Avenue Improvement (Pa.), vol. 2, 32.

Street Improvement Under Tennessee Front Foot Assessment Law.

A decision by Chancellor Minor of Tennessee approves the amendment to the front foot assessment law, which has been under doubt. This amendment gives the city the initiative in ordering street improvements, two-thirds of the cost of which is paid by the abutting property owners. The amendment further dispenses with the necessity of a petition from 60 per cent. of the owners of abutting property. This decision gives the city the power to order improvements up to the limit of its proportionate bond issue.

Litigation Arising from Michigan City Pavement Contract.

In a complaint filed in the Federal court at Indianapolis by the Warren-Scharf Asphalt Paving Company, a corporation of New York, against the city of Michigan City, Ind., a story is told of a tangle that resulted from an effort to straighten out a contract between the city and the paving company. The case grows out of the paving company having improved three streets in Michigan City, and the complaint is divided into three paragraphs, in each of which judgment is asked on the ground that certain money is still due the paving company for the improvements. The judgments asked aggregate $12,000. It is alleged that there is due, as unpaid assessments for the improvements, more than $6,000 for the three streets.

The complaint grew out of the city having originally accepted the bid of another contractor and then having awarded it to the plaintiff as the next lowest bidder. Some of the property owners contested the payment of assessments to pay for the improvement, and the matter was carried to the appellate court of Indiana, where it was decided that the contracts between the city and the plaintiff were invalid, as the city should have readvertised for new bids.

In an effort to remedy this the board of works then advertised for bids for the improvement of the three streets, and, after accepting the bids of the plaintiff, adopted a resolution declaring that the performance under the old contracts by the plaintiff be accepted as a performance under the new contracts. It is alleged, however, that the board refuses to make a final assessment against those property owners who have failed to pay their assessments.

Sewer Contractor Restrained from Interfering with Water Pipes.

Taking the stand that the defendant's interference was both unnecessary and arbitrary, Judge Fuller in an opinion handed down in the case of the People's Water Company of Pittston against Edward Healy, a sewer contractor, continues the injunction restraining the defendant from laying pipes which injure the plaintiff's mains.

The action was brought some weeks ago and was to restrain the defendant from laying sewer pipes over the pipes of the plaintiff. The defendant had a contract with the city of Pittston to construct a sewer upon Tompkins street, the specifications providing that the sewer was to be laid in the center of the street.

It was alleged on the part of the company that the defendant constructed the sewer in the center of the street for a certain distance and that work on one end of the sewer was begun on the westerly side of the street so as to interfere with the company's pipes. The weight broke the water mains and cut off the supply to the hospital and other patrons.

Nebraska Paving Law Constitutional.

The decision given by Judge Troup in the Florence paving case will affect similar cases which have been pending in Nebraska villages for several months.

In the Florence case Judge Troup held that the contract awarded by the village board a year ago to M. Ford was valid. The decision upheld the constitutionality of the law, upon which the attack was made. The village board of Dundee has been holding back in its paving vote until the decision should be made.

Denver Wins Civic Center Suit.

A decision by Judge Riner of the U. S. Circuit Court dismissed the case of Wm. J. Pochin, who sought to block the Denver Civic Center improvement. It was proven that in order to bring the case under the jurisdiction of the Federal court a transfer of property valued at $12,000 had been made for the consideration of $1. This evident collusion of the parties back of the suit was responsible for its dismissal from court. The next step on the part of the city will be

the appointment of a condemnation commission and the introduction of the assessing ordinance in the city council.

The improvement in question contemplates the acquisition of a tract of land for the purpose of a plaza. This plaza is to contain the library, the Pioneer monument, ornamental fountains and a stadium for out-of-door meetings.

Plymouth Wins Suit for New Bridge.

About two years ago Plymouth, Pa., started a movement to build a highway bridge across the Susquehanna river. Authority was given to the commissioners to build a structure to cost $175,000. Viewers were appointed and they returned a report fixing the cost at about $50,000 in excess of the above amount. The commissioners, believing they had no authority to make such expenditure, refused to go ahead with the work. A suit was then brought to compel the erection of the bridge, with the result that a mandamus was granted by Judge Ferris compelling the construction to be carried out.

North Platte, Nebraska, Released from Water Works Contract.

In the case involving the ownership of the North Platte water works, valued at $85,000, Judge Munger has decided that the city cannot be compelled to take over the water works against its will. The point at issue was whether the city council had made a valid agreement and contract with the company to take over the plant on the terms offered by the company.

Judge Munger holds that it was necessary for the council to pass an ordinance in the matter, specifically agreeing to take the plant. Instead of this procedure council passed a simple motion. This the court holds was not sufficient.

WATER AND LIGHT

Urbana Water Works—Brooklyn Water Supply—Saginaw Fire Pressure—Illinois Surface Waters—Mississippi Basin Waters—Johnson City Water Works—Card Index for Fire Fighting—Telephone Fire Alarm—Crawfordsville Gas—Birmingham Gas Profits—Tarsus Has Electric Light—Pasadena Light—Westfield Municipal Gas Plant—Ornamental Street Lighting

Increased Water Supply for Brooklyn.

The sources of water supply in Brooklyn and Queens will be greatly increased by the appropriations which have been made for that purpose by the board of estimate. The water supply in Long Island City is to be connected with the Croton supply in Manhattan, and the outlying sections of Brooklyn, such as Borough Park, New Utrecht and Coney Island, will receive new distributing mains.

For Queens the board has authorized an appropriation of $450,000. The plan is to lay a 48-inch pipe line through Eighty-second street, Manhattan, from the Central Park reservoir to the East river. The pipe line under the East river will be 38 inches in diameter, and the distributing mains in Long Island City will be reduced to 30 inches.

This additional source, it is expected, will increase the water supply in Long Island City sufficiently to obviate the necessity of purchasing some of the private water companies which are now operating in Queens Borough.

The following appropriations, which were authorized some time ago by the board, have been rescinded: $435,000 for a new pumping station at Massapequa and $350,000 for new distributing mains in the Seventh, Twenty-third, Twenty-fifth and Twenty-sixth wards.

Saginaw Needs Higher Fire Pressure.

Fire Chief George W. Walles, of Saginaw, Mich., has requested through the local papers that when a fire alarm is sounded all lawn hose and house connections will be promptly turned off. This is necessary in order to obtain the required fire pressure where needed.

Urbana, O., to Purchase Water Works Plant.

After years of litigation the city of Urbana, O., has decided to own and control its own water works plant. Some months ago Robert W. Kirby, receiver of the Urbana Water Works Company, sued the city to recover money claimed to be due him as a result of the raising of the rates for furnishing water to the city. He was awarded a very large sum as back pay, and thereupon the city authorities appealed the case to the Federal Court of Appeals.

Receiver Kirby reports that on June 24 last the city council of Urbana passed a resolution, approved by the mayor, providing for the purchase of the plant for $150,000 and to withdraw its appeal from the decree made last December in favor of the receiver. Judge Hollister at once made an order giving the receiver authority to accept the proposition, subject to the approval of the court.

Surface Water Supplies of Illinois Impure.

A report issued by the United States Geological Survey sounds a warning to the cities of Illinois, outside of Chicago, regarding the purity of the sources of water supply. Chicago's Lake Michigan water is pronounced the best in the state, but most of the rivers and other streams examined show so much impurity that their waters constitute a menace to health. The report asserts that almost any surface water in Illinois is sure to be polluted and dangerous to use for drinking. By far the greater number of Illinois cities of large size obtain their water supplies from surface waters which are badly polluted.

The investigation was made by W. D. Collum, assisted by Edward Barton, director of the Illinois River Survey; L. P. Breckenridge, Arthur N. Talbot and Samuel W. Parr, of the engineering experiment station at the University of Illinois, and H. Foster Baird, of the Illinois Geological Survey.

Samples of the findings in the cases of the rivers and the cities at which waters were examined are as follows:

Sangamon river, Decatur, Springfield, Chandlerville—At Decatur the water is treated and furnishes a satisfactory supply; at Springfield it is neither inviting to drink nor cleansing.

Illinois river, La Salle, Peoria, Kampsville—Illinois water is not used for municipal supply; it is doubtful if the time will ever come when it will be looked upon with favor as a source of municipal supply. The large amount of sewage in the Chicago drainage canal would make people hesitate to undertake the purification of the water.

Mississippi river, Moline, Quincy, Chester—Where the river furnishes the supply of water for domestic uses some method of purification is used.

An explanation is offered in the report for the variations in the quality of water at different times and places.

Surface Water Supply of the Upper Mississippi River and Hudson Bay Basins.

In United States Geological Survey Water Supply Paper 245 is given a complete record and description of the surface drainage of the upper Mississippi river and Hudson Bay basins. The paper was prepared, under direction of Mr. M. O. Leighton, by A. H. Horton, E. F. Chandler and R. H. Bolster.

Municipal Water Works for Johnson City.

Johnson City, Tenn., has purchased the entire pipe line distributing system of the Watauga Water Company. The purchase price named was $140,000.

The Card Index Applied to Fire Fighting.

The *Montreal Daily Witness*, in connection with comment on the $500,000 *Montreal Herald* fire, proposes a system to aid in the intelligent handling of large fires. The plan is as follows:

That there be created a card index, which, with simple and conventional diagram and signs, would indicate at a glance the nature of a building and its contents, and particularly the location of dangerous features, such as excessive weights on upper floors, explosives, or basements from which there are no exits, and so forth, and that would indicate the position of stairs, elevators, fire escapes and other exits, that would show the precise position of the main gas cock and electric light switch, so that these might be immediately shut off on the arrival of the firemen, thus preventing adding fuel to the fire or endangering those in the building by asphyxiation through the escape of gas, and preventing electrical short circuits and the danger to those in the building of electrocution through damaged wires. The diagram or chart would also show in simple way the position of machinery or valuable stock, in the first instance, for the guidance of the salvage department, and also that the chief may know in what part of the building there is most treasure. The diagram might also show in conventional fashion the kind of roof, the nature of the walls, showing also any internal unprotected connection with adjoining buildings. Figures at the upper right-hand corner of each flat would indicate the number of employes belonging to such flat, and immediately under them other figures would indicate the value and approximate weight of the contents of that flat. Light machinery might be indicated by a series of light crosses, heavy machinery by heavy crosses, and the underscoring of anything emphasizing that it was, comparatively speaking, of special value. The letters "VS" might show the location of particularly valuable stock, and a circle with a heavy "T" in it the position of treasure, not only such as specie and jewelry, but such, for instance, as special dies and tools, which are sometimes as valuable, if not more so than jewelry itself. Any explosive material might be indicated by a sun with an "X" in the center, while a dangerous weight on an upper floor would be indicated by a black block.

It is suggested that there be four copies made of the card for each building, one to be placed conspicuously near the main entrance, one to be sent to the fire department, one to the building inspector

and one to the factory inspector; that before the card finds itself placed in the index of the fire chief, his inspector will make a visit to the building and see that the card has been properly prepared; that explosives are placed within easy access of door or window, so that they may be quickly removed from a burning building, and that dangerous weights will, where feasible, be carried by additional supports. The building and factory inspectors will also vise their copies of the card, and the facts therein given may lead to a more particular inspection of the building if there is evidence of overloading or liability to excessive vibration from the machinery it contains. It is further suggested that this index be revised at least every six months and at other times when there are considerable alterations in the building or in the disposition or weight of its contents. The placing of the plan at the main entrance, with the date of its preparation upon it, would render it open to the inspection of the police force, who would report any delinquency in the semi-annual renewal of the plan; it would also be open to complaints from employes who felt the facts were not correctly shown, and last, but not least, would be accessible on the arrival of the brigade. The home of the fire department's card index, however, might very well be in drawers in the vehicles of the district captains, so that when the captain arrived at a fire and while his men were raising ladders and connecting hose to the hydrants, he would have thirty seconds in which to pick out and survey the card in case he did not find it at the entrance of the burning building. As the face of these cards would have simply the diagram, with its conventional signs as regulated by the department, and marginal notes of the simplest, he would get all the main facts at a moment's glance. On the back of the card there would be printed a form to be filled up, which would contain all other information that he might be anxious to know, such, for instance, as the position of the nearest hydrants, whether the water tank has independent supports or otherwise, whether the hoist has fireproof walls and doors, and other matters that he might be most anxious to know about. This information on the back of the card would be always in the same order, the cards being provided by the fire department, with a sheet of instructions for their proper preparation. Very large buildings might require large cards, folded, however, to the adopted index size. Fire chiefs would become so intimate with such a card that they would read its contents almost as quickly as they would the face of an ordinary playing card. With such information before him, a fire chief could marshal his men to the best advantage in their fight with the flames and in their salvage of life and property, and at the same time could avoid the accidents which so often befall firemen in the exercise of their duties through the falling of heavy weights from upper floors, by asphyxiation by gas, by explosion, or by electrocution.

Fire Alarm for Small Town Sounded from Telephone Station.

An improvement in the manner of ringing the fire alarm has been inaugurated by Mayor Brinkman, of Warsaw, Ill. A solenoid has been installed in the central office of the Mississippi Valley Telephone Company, and by simply turning a switch the operator releases a thirty-pound hammer in the tower of the City Hall, a block away, which strikes the bell, making an alarm many times louder than by ringing the bell with a rope.

Crawfordsville Water and Gas Company Purchases Old Mains of Indiana Lighting Co.

The Crawfordsville Water and Gas Company has a clear field now, as it has secured all the old mains and other fixtures by a recent deal. The old gas mains were owned by the Dietrich syndicate until a year or so ago, when they were taken over by the Indiana Lighting Company. This company took over the property in this city, Lebanon, Frankfort, Thorntown, Darlington and other points from the Dietrich system.

The Street-Wykes syndicate, of New York City, controls the Crawfordsville Water and Gas Company, the water works plant of Shelbyville and the artificial gas plant at Warsaw, besides plants at other points. By the terms of the deal the Indiana Lighting Company gets a small interest in the Crawfordsville Water and Gas Company, which is capitalized at $200,000. There are eighteen miles of the old gas mains in the city, which the local company secures by the deal.

Public Ownership Profits in an English City.

Consul Albert Halstead reports that the profits on the gas, street railway and electric supply departments of the English city of Birmingham for the year ended March 31, 1910, aggregated $562,845, an increase of $23,242 over the previous municipal year.

Of these profits the gas department contributed $352,787, an increase of $5,027 over 1908-9 and $54,403 over 1907-8. The street railway department contributed $160,180, an increase of $17,000 over 1908-9, and despite the fact that by shortening the hours of motormen, conductors and other employes the wage cost was increased by about $38,932. The electric supply department contributed $49,882, an increase of $1,182 over 1908-9.

These net profits are allotted for the reduction of taxation, and the profit is

only regarded as net after sufficient sums have been set aside for depreciation, reserve and repayment of capital borrowed. The gas department, in addition to its contribution of $352,787 for the relief of taxation, contributed $19,466 to the city and $54,641 to the public lighting in the city, making its total of actual profit above all expenses for supplies, wages, maintenance, depreciation, etc., $425,889.

The returns from other departments of the city, such as water, markets, etc., are not in, but as the water department, by reason of the great cost of construction, is a constant charge on the city taxes, the net profit on all city business undertakings will be reduced to about $146,000.

Advancement of Ornamental Street Lighting.

During the past month a marked advancement of the cause of good street lighting has been apparent. The cluster system adopted in Indianapolis, which was described in the July issue, has been further extended. An accompanying photograph shows the excellent effect obtained upon Washington street in that city.

ILLUMINATION OF WASHINGTON STREET, INDIANAPOLIS.

Among the cities that have installed this "Great White Way" system during the past month are Niagara Falls, N. Y., Oklahoma City, Okla., and South Bend, Ind., while Germantown, Pa., Fargo, N. D., Richmond, Va., Atlantic City, N. J., Syracuse, N. Y., Rockford, Ill., and Ocean City, Pa., are among the cities that have adopted the plan and will soon be numbered among those that are advancing the cause of better public lighting.

Ancient City of Tarsus Illuminated by Electricity.

The ancient city of Tarsus, in Asia Minor, where the Apostle Paul was born and which was a great seat of learning at that time, is catching up with the progress of civilization, and is now illuminated by electricity. Consul Edward Inathan, of Mersine, in a report to this government on the electrification of the ancient city, says that the power is taken from the Cydnus river. There are now in Tarsus 450 electric street lights and about 600 incandescent lights for private use. It is proposed to extend the lighting system to Adana and Mersine.

Pasadena's Lighting Issue.

Although running at only half its total capacity, the municipal lighting plant of Pasadena, Cal., clears expenses, takes care of interest and sinking fund, and puts aside what its engineers claim is sufficient for depreciation. This is done on a 7-cent rate. The city now proposes that if it can secure about 40 per cent. more patrons, it will cut its rate to 5 cents. It offers a three-year contract, with further provision for cutting if the city sees fit. The Edison Company, the same one that supplies Los Angeles with light at a 7 to 9-cent rate, offers Pasadena a 4-cent rate. This is noteworthy inasmuch as Los Angeles is a much larger consumer than is Pasadena. It is clearly a competition between the Edison Company and the corporation of Pasadena, and the outcome is a matter of doubt.

Enlargement of Municipal Gas Plant at Westfield, Mass.

A short time ago the town of Westfield, Mass., expended about $25,000 in erecting a new gas holder, bringing the capacity of its gas plant up to 75,000 cubic feet of gas a day. The present plan is to increase the capacity from 75,000 to 125,000 cubic feet a day. The sum of $15,000 has been set aside for the proposed work. The additions will consist of enlarging the building, the buying and installing of new benches and new gas manufacturing machinery.

Investigation of Washington Gas Cost.

An investigation of the affairs of the Washington Gas Light Company is necessary, according to a report submitted to the Senate March 14, in order to enable Congress to fix intelligently a proper price for gas sold in the District of Columbia. The report states that the reasons for the resolution are as follows:

1. The Washington Gas Light Company, being a creature of Congress, Congress is responsible for its behavior. In order to discharge this responsibility Congress should know all of the facts incident to the business of the company, its capitalization, the extent and value of its service to the public.
2. Such information is not obtainable from the annual reports of the company made to Congress.
3. The act of 1848 limted the authorized capital stock of the company to $50,000, which has since been increased to $2,600,000, some of which, it is claimed, is without legislative sanction.
4. The company has outstanding certificates of indebtedness equal to its capital stock, to-wit, $2,600,000, bearing 6 per cent. interest, all of which, it is claimed, is wholly unauthorized by law.
5. It is impossible for Congress to determine what is a reasonable charge for gas unless Congress shall first know the value of the plant, the amount actually invested, and the cost of production.

The report continues:

From the legislative history of the company since its charter was granted in 1848, it is clear—

First, that the capitalization of the company is within the control of Congress.

Second, that the company has accepted such authorizations as Congress has given it, and has acted thereunder.

Third, that the company availed itself of that portion of section 5 (since repealed) of the 1896 act authorizing it to convert certificates of indebtedness in the sum of $600,000 into capital stock.

Fourth, that the certificates of indebtedness were issued without any express authority of law; their validity and so much of the capital stock as they represent is therefore open to serious question.

Fifth, if certificates of indebtedness represent no actual indebtedness due from the company, but, in fact, represent earnings and profits, they operate as an unauthorized increase of capital stock in violation of law.

Sixth. It is obvious that Congress never intended the company should have power to issue any certificates of indebtedness.

Congress, in all of the legislation referred to, has asserted its control of the capital stock issued by the company, manifestly for one purpose, that purpose being to protect the public against extortionate charges for gas based on an excessive capitalization. If an investigation shall develop that the $2,600,000 evidenced by certificates of indebtedness bearing 6 per cent interest, in fact, represent in any sense a valid indebtedness, it is clear the public has been wronged. Such wrong cannot be remedied by Congress unless and until Congress first ascertains the truth about the actual consideration for such certificates.

The report states that the original act of 1848 was silent on the subject of gas prices. This act of June 25, 1860, was the first attempt of Congress to fix the price. The price was made at 35 cents per hundred cubic feet, subject to discount at 10 per cent. if paid at a certain time. The act of 1862 fixed the price from July 1, 1862, at 28 cents per hundred cubic feet of gas furnished to the government and 30 cents to other consumers. The act of January 30, 1865, repealed the acts of 1860 and 1862, prohibiting the company from receiving on and after December, 1864, a greater price for gas than 40 cents per hundred cubic feet, subject to a 10 per cent. discount on all government bills, and 5 per cent. for all other consumers. The act of June 23, 1874, fixed the price of gas at the rate of $2.50 per thousand cubic feet furnished the government, and its other consumers, $2.75 per thousand feet. The act of June 6, 1896, fixed the price of gas for the Washington Gaslight Company at a rate not to exceed $1.10 per thousand feet until July 1, 1901, and after that at $1 per thousand cubic feet. The company ras recently reduced this rate to 90 cents per thousand cubic feet, if paid at a certain time, but raised the rate to $1.10 if not paid then, in clear violation of the law. Continuing the report says:

The last annual report of the company, made to Congress February 1, 1910, purporting to give a detailed statement of its business for the year ending December 31, 1909, shows the net earnings, after deducting operating expenses, to be $640,631.50. This was 12 per cent. plus on capitalization of $5,200,000, assuming the certificates of indebtedness to be a part of the capitalization. If we exclude the certificates of indebtedness, a net earning of 24 per cent. plus on the actual capital stock is reported by the company. It goes without argument that such a net income is excessive unless the facts shall disclose that the actual value of the plant and the actual amount invested is far greater than its capital stock. On page 2 of the report it appears that what is called "a regular" dividend of $260,000 had been paid the stockholders, also, an "extra" dividend of $260,000, or, in all, 20 per cent. paid in dividends during the year. In addition to these dividends the company expended $203,524.06 in extensions, constructions, etc., and had left a surplus of $238,355.03.

Waste in Unredeemed Cement Sacks.

During the months of March and April the Universal Portland Cement Company used about 3,000,000 cloth sacks in excess of the number returned by customers for credit. For these sacks the company pays at the rate of 10 cents each, which means that their customers have $300,000 coming to them from this source. Another interesting feature of the matter is that while the company carries a tremendous reserve stock of empty sacks, the largest stock could not be expected to stand a drain at the rate of 1,500,000 a month for any considerable length of time.

SEWAGE AND REFUSE

Public Comfort Stations in Indianapolis, Pasadena, Dresden—Springfield, O., Sewerage—New York Garbage Disposal Law—Cost of Street Cleaning—Columbus Garbage Reduction

Indianapolis Public Comfort Station Opened.

It is estimated that nearly 2,000 persons made an inspection of the Indianapolis public comfort station on the opening day, July 19. A description of the station is given in the July issue of MUNICIPAL ENGINEERING. The station, completed, cost approximately $17,000. Stilwell & Co., of Lafayette, contractors, had the contract. An appropriation of $20,000 was made for the completion of the work. The station will be in the charge of two men and two women from 7:30 o'clock in the morning until 11:30 o'clock at night.

Pasadena's Novel Public Comfort Stations.

Along the line of the public comfort station of Indianapolis, mentioned in the July number of MUNICIPAL ENGINEERING, Pasadena, Cal., has a system which differs from that of Indianapolis, in that private stations are maintained. Some of the leading merchants of the city have agreed to maintain such stations for the benefit of the public. The location of these will be indicated by a red cross within a green circle, with the letters M and W, for men and women, respectively.

Mr. A. C. Shover, plumbing and building inspector of Pasadena, has been largely instrumental in bringing about this public sanitary advance, and over thirty merchants of the city have lent their practical aid to the proposition.

Dresden's New Public Comfort Station.

In the capital of Saxony, Dresden, a new type of public comfort station has lately been turned over to the public. The new type of station is a marked improvement over the old box-like structure, closely walled up and apparently without ventilation.

The station is a structure of stone, with a broad arcade-like front, supported by four heavy stone columns. The first floor is devoted to a florist's shop, a news stand, a public telephone pay station and toilet rooms, those for the men and women being on opposite sides of the building, with an attendant's room between.

On the lower, or basement, floors are public urinals and free washbasins. Automatic venders supply towels and soap. This room is not under constant care, but is washed and the brasses are polished every morning.

One factor that seems to have been improperly cared for is the matter of heating the station. The basement floor has absolutely no provision for heating, while the upper floor is heated by small coal stoves. The building is wired throughout for electricity, but gas is supplied only in the attendants' room, for cooking, and no provision is made for hot water at the lavatories.

The Sewerage System of Springfield, O.

Springfield, O., is at present engaged in the construction of 120 miles of sewer, to cost about $860,000. The separate system was adopted, owing to the excessive cost of rock excavation, which forms the great portion of the necessary excavation, and by reason of the fact that mechanical disposal is necessary.

The sewers are designed upon a basis of seventy-five gallons per capita daily and a population of 160,000, it being estimated that during the life of this system about two-thirds of the population will be connected with the sewers, and at the end of forty years they will run two-thirds full.

The city is divided into districts, each district being a small system by itself and having access to an intercepting sewer. In the residence portion of the city the sewers are mostly designed as vitrified pipe, 8 and 10 inches, depth 8 feet, with 6-inch house connections, based upon population of an average block which will remain constant throughout the life of the system. The system is self-cleansing, reinforced by flushing tanks at the upper end of the various laterals. One excellent provision in regard to the sewer construction is the requirement that laterals must be carried to the curb line of the street at each property at the time of constructing the main sewers. This method, if carried out in all underground construction work, would make possible a system of good roads and their easy maintenance. The flushing tanks are built underground, capacity 850 barrels, being connected with the city water mains, used at least once a month. This water is furnished free by the city at the present time. No storm water is taken into the sewers.

The system, as constructed to date,

cost $265,000, all built by contract labor, which, under severe competition, reduced the price of sewer construction to its lowest value. Mr. M. J. Bahin is chief engineer in charge of the work.

Cost of Street Cleaning.

The cost of street cleaning has been considerably discussed in Newark, New Jersey, during the last three or four months. As a result, statistics have been carefully gathered from nineteen municipalities covering every phase of street cleaning operations. On a population basis the city of Newark pays more than any of the nineteen cities for cleaning the streets, as the following table will show:

	Population.	Square Miles Territory.	Cost of Cleaning Streets.
Chicago.....	2,500,000	190½	$778,437.00
Philadelphia.	1,545,800	129½	1,199,000.00
St. Louis....	750,000	61 1-3	360,000.00
Boston	629,478	42 2-3	419,275.00
Pittsburg ...	580,000	41	399,353.00
Cleveland ..	525,000	45	192,000.00
S. Francisco.	500,000	43	252,900.00
Cincinnati ..	460,000	43½	169,200.00
Detroit	450,000	40	172,246.83
Buffalo	425,000	42	141,189.97
Milwaukee .	400,000	22¼	160,000.00
New Orleans	375,000	192	199,488.00
Washington.	345,000	69¼	213,990.00
Newark	320,000	23	295,220.67
Minneapolis..	300,000	53¼	79,320.00
Louisville ..	253,000	...	206,000.00
St. Paul ...	235,000	55½	72,320.00
Providence .	215,000	18¼	80,425.00
Rochester ..	210,000	...	94,790.00

On the basis of the miles of paved streets cleaned, however, the statistics from the cities show a comparison that may be considered fairer, which are as follows:

	Miles of paved sts.	Total cost.	Cost per mile
Cincinnati ...	476	$169,200.00	$355.51
Buffalo	361	141,198.97	391.11
Detroit	358	172,246.83	481.12
Chicago	1,614	778,437.00	482.30
Rochester ...	178	94,790.00	532.53
St. Louis.....	589	360,000.00	611.21
Minneapolis .	126	79,320.00	629.52
Cleveland ...	300	192,000.00	640.00
San Francisco	357	252,900.00	708.40
Washington .	289	213,990.00	740.45
New Orleans.	268	199,488.00	744.32
Pittsburg ...	500	399,353.00	798.70
Boston	514	419,275.00	815.71
Philadelphia.	1,365	1,199,000.00	878.40
Louisville ...	195	206,000.00	1,056.41
Newark	201	295,220.67	1,468.76
St. Paul	48	72,320.00	1,506.66
Providence ..	46	80,425.00	1,726.63
Milwaukee ..	80	160,000.00	2,000.00

Legislation Regulating Garbage Crematories.

Crematories for the disposal of garbage within ten miles of the corporate limits of any city in the state of New York are to be operated in the future, with such appliances and methods as to prevent offensive and noxious gases and fumes arising from the treatment of garbage, offal, dead animals or fish. A private corporation or a municipality operating any such crematory which allows or permits such a nuisance is deemed guilty of a misdemeanor, punishable by a fine of not less than $100 or more than $250 for each day that the odors are permitted to exist, or by imprisonment for not more than one year, or both. The new law takes effect on September 1.

The Municipal Garbage Reduction Plant at Columbus, O.

On Wednesday, July 20, 1910, the new garbage reduction plant at Columbus, O., was put in commission and started off smoothly at a very leisurely rate, as the capacity of the plant is 80 tons of garbage a day and at the beginning but half this capacity will be required, or even less during the period of getting the new municipal collection system in operation.

A number of new steel wagons with tarpaulin covers have been purchased and put in service to collect the garbage and deliver it on Mound street at the canal, where it is dumped into special compartment steel cars and hauled by the Hocking Valley railroad over the city's own railroad to the reduction plant, which is located next to the sewage disposal works, about 1½ miles south of the city limits.

The cars are run into a small building at the plant, the track being several feet above the level of the ground. Here they are dumped down a sloping concrete surface onto a slightly sloping floor. On this floor the tin cans, bottles, and other materials objectionable to the subsequent processes are picked out, and the garbage is shoveled into a channel alongside the floor. In this channel runs a conveyor designed and built by the Jeffrey Mfg. Co., of Columbus, the vanes of which draw the garbage through the trough in the small building, up an enclosed inclined trough leading to the top of the main building and thence along a horizontal trough over the six garbage cookers, into any one of which it is dumped by opening a slide in the bottom of the trough. The garbage, somewhat dried during the process of picking over and conveying, drops through the hole and slides down a steeply inclined chute into the open top of the tank being filled. The chute is revolvable so that it can reach several of the cooker tanks in turn.

When a tank is filled it is tightly closed and steam is turned in for sufficient time to remove the grease from the garbage. The tank is then cooled off and allowed to settle until the solid matter drops to the bottom and the oil rises to the top. The oil is then drawn off into the system of separating and purifying tanks for further preparation for market. The water is drawn off into a large tank and thence to an evaporator made by the Zaremba Co., of Chicago, which reduces it to a consistency something like molasses, called "stick," any remains of oil or grease being drawn off. The solid matters are dropped out of the

bottom of the tank into an Edgerton roller press made at Kutztown, Pa., where the water remaining in it is pressed out and transferred to the water purifying system. The dried and pulverized "tankage" is dropped into a conveyor, which carries it to and dumps it near a large tank into which it is shoveled and mixed with the "stick," and is then ready for sale to the manufacturers of fertilizers.

The plant is almost wholly automatic in its operation, the only hand labor being used in picking the inorganic refuse out of the garbage and shoveling the latter into the conveyor trench, and in handling the tankage at the mixing tank. These are the only points at which the operation of the machinery cannot be continuous and there is consequent danger of congestion, or where the separation cannot be automatic.

The plant was designed by chief engineer Osborn, who is a "graduate" from the Toledo reduction plant. He was in charge of its construction and will be in charge of its operation until everything is in complete and smooth running order.

The writer visited the plant during the morning of the first day of operation when two of the cooker tanks had been filled and steam turned on and a third was filling, so that the subsequent processes and the machinery for them had not yet been tested. The process is a closed process except the picking over of the garbage and the long distance it is conveyed to the cooker tanks, and also the conveying of the tankage from the press to its dumping place and the shoveling of the same into the mixing tank. This reduces the danger of nuisance to the odors from these two masses of material, which are of comparatively low temperature. The scattering of odors from the raw garbage would be less if it were dumped at the cookers, but there are some disadvantages about the latter plan. Whether they outweigh the greater danger of nuisance from the drying garbage during the rather long distance it is conveyed from the dump house below to the cooker floor above must be settled to some degree by experience. The same may be said of the rather warm tankage if it is not handled promptly at the mixing tank.

Statements of the cost of the plant vary somewhat, but approximately the buildings seem to have cost $100,000, the complete equipment of machinery $150,000 or $250,000 for the reduction plant and, with the collection plant added, $290,000 for the whole system.

The tin cans will be pressed in bales and sold. The bottles will be sold or used for filling with other refuse. Combustible and comparatively innocuous refuse is not cared for by the present system and the problem of its collection and disposal must be worked out later.

STREETS AND HIGHWAYS

Cement Streets—Cement Macadam—Prizes for Maintenance—Venezuelan Asphalt—Brick Pavement Inspection—Denver Asphalt Plant

Fond du Lac's Cement Streets.

In a paper given before the League of Wisconsin Municipalities, City Engineer J. C. McCullogh, of Fond du Lac, gave a detailed discussion of "Cement Streets." In speaking of them he says:

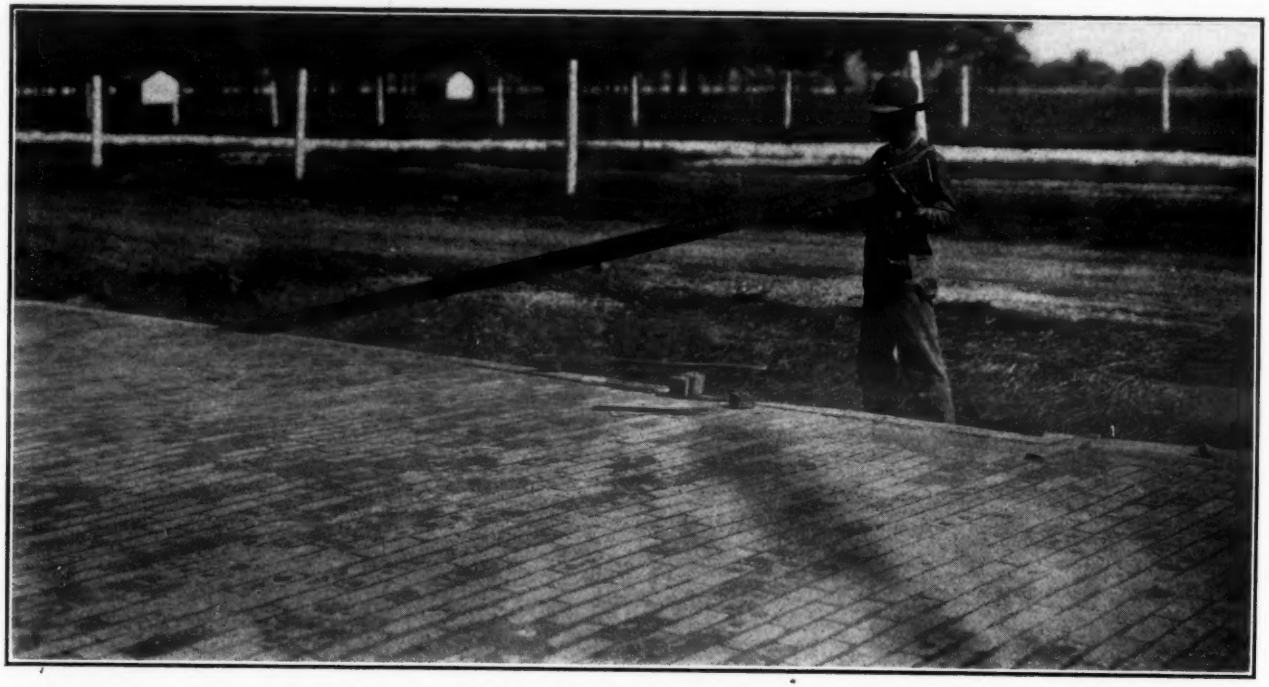
The city of Fond du Lac has had the ordinary experience of cities of its age and size. It has had the graveled road, the plank road, Nicholson block and cedar block, and we now have common macadam, bituminous macadam, asphalt, brick and concrete streets. The past three years we have built principally concrete pavements. We do from $90,000 to $100,000 worth of this class of improvement work a year, about 20 per cent. of the cost of which is paid from the general fund and balance by abutting property.

The concrete pavement is not claimed to possess all good features and no faults. As we build it we have been trying to build a cheap pavement, and we claim for it cheap first cost, ease of traction, that it will stand the wear from automobile traffic, that it is easily cleaned, and is sanitary, not more slippery than brick or concrete block, and we hope it will not cost much to maintain. Its one fault that we acknowledge is its tending to crack from contraction.

To try to overcome the contraction crack that first appears longitudinally in center of pavement, we are this year building about 1½ miles in which we put a wire mesh reinforcement in the concrete. If the pavements continue to crack to such an extent as to render resurfacing necessary in the course of eight or ten years, I see no reason to prevent us putting on an asphalt wearing surface.

My theory is that the pavement expands all right wtihout any bad effects, but when contraction sets in, the mass will not hold together, to creep back up over the crown of the street, and that in reality the pavement creeps down hill, or toward the curb, both in expanding and contracting. We put in a very little crown on that account.

For the amount and kind of traffic on



THE SPEEDWAY, INDIANAPOLIS.

Cement Filling Completed. Removing Board to Make Expansion Joint.

the majority of the streets in a city of this size, the cement pavement is a good enough pavement, and is as good value at its price as one of the higher grade pavements would be at the price they cost.

I have compiled some figures to show you the cost of our work to date:

In 1908 were laid 1¼ miles, requiring 14,732 yards, at an average cost of $1.32½.

In 1909, 3 8-10 miles, or 69,197 yards; average cost, $1.23½.

In 1910, this season, we built and have under contract, 3½ miles, or 55,394 yards, at an average cost of $1.16½, including about 1½ miles of reinforced pavement, the average cost of plain concrete being $1.10.

At the end of this season we expect to have sixteen concrete streets, comprising eight to ten miles, at an average cost of $1.21.

Cement Filled Macadam Road in Wayne County, Indiana.

One of the biggest gravel road contracts ever awarded under Indiana's three-mile road law was let July 11 to John F. Cronin & Co., of Richmond, Ind., the contract price being $52,000 for the road proper and approximately $2,500 for a dressing of asphaltic cement, to be used on that section of the road within the city of Richmond. The road to be improved is the historic National road, from a point in West Richmond to the boundary line of Center township, a trifle less than three miles west of Richmond.

The stretch of road to be constructed here will be wholly unlike any other highway in the state. Cement curbs and gutters will flank the roadway its entire length. The road itself is to be constructed of crushed stone, with cement filler, and the whole is to be pressed into a solid mass with ten-ton road rollers. The width will be forty-five feet.

Prizes for Road Maintenance.

The Chamber of Commerce of Quincy, Ill., have offered gold prizes aggregating $630 for the best strip of dirt wagon road. The road must be kept in condition with a split log drag or similar device, and the competition covers the period from July 1, 1910, to May 31, 1911.

Increased Output of Venezuela Asphalt.

It is expected, according to reports received from the United States minister to Venezuela, that the asphalt shipped from Guanoco will this year reach an amount in excess of 40,000 tons. Guanoco is a little inland town of 200 population, and is reached by boats up through the gulf of Paria and the rivers of San Juan and Guanoco. The asphalt deposit is about five miles from the nearest river point, and the asphalt is carried across country by a small narrow-gauge railway.

The Inciarte deposits will export a less amount, owing to the greater difficulty of transportation. A railway twenty-seven miles in length is necessary to transport the product of the Inciarte deposits to the nearest navigable water, the Limon river, and from here the asphalt must be carried in small boats to Maracaibo lake. This double handling makes the development of the Inciarte regions less rapid than might otherwise be expected.

Denver's Municipal Asphalt Plant.

Denver's municipal asphalt plant will commence operations on August 1, after which time all asphalt cement used in street repair and resurfacing will be manufactured by the city. It is the intention, if the project proves a success, to enlarge the plant so as to furnish asphalt cement for all new streets, but at present the repair work is all that can be handled.

The new municipal undertaking has cost to date approximately $25,000, of which $7,500 was expended for the site and $17,150 for the buildings and machinery. The buildings are of steel and cement and are fireproofed throughout. The capacity is 1,000 square yards of 2-inch surfacing per day. The raw material to be used at the Denver plant is taken from the asphaltic base oils by a process of distillation, which draws off all water, gasoline, kerosene and the lighter oils, leaving a heavy residue which in the case of California and Texas oils is 99 per cent pure asphalt bitumen.

Mr. S. R. Murray, who supervised the construction of the plant and who is to have charge of its operation, was formerly superintendent of the Indianapolis plant and has had seventeen years' experience in the asphalt business. He estimates that the plant will pay for itself in two seasons.

Indianapolis, Detroit, Columbus and Dayton are among the cities that have established asphalt works and demonstrated their practicability. Winnipeg and Hamilton, in Canada, have asphalt plants that not only furnish material for repairing the streets but also for laying original paving in lieu of by private contract work.

An Official Inspection of Brick Pavements.

During the four days beginning July 18 a large committee of municipal officials and others inspected brick pavements and brick roads in Indianapolis, Marion county, and Terre Haute, Ind., Cincinnati, Columbus, Cleveland and Cuyahoga county, Ohio, upon the invitation of the National Paving Brick Manufacturers' Association, extended through Will P. Blair, their efficient secretary. The invitation included the committee on standard specifications of the American Society of Municipal Improvements, of which three of the five members responded, viz., Charles H. Rust, chairman, city engineer, Toronto, Ont., Edwin A. Fisher, city engineer, Rochester, N. Y., and Charles C.

SOUTH SIXTH STREET, TERRE HAUTE, IND.

Cement Filler, Eighteen Years Old. Smooth Pavement With Perfectly Filled Joints.

Brown, consulting engineer and editor of MUNICIPAL ENGINEERING, Indianapolis, Ind.; the committee on brick paving of the Organization for Standardizing Paving Specifications, of which a majority responded, viz., E. H. Crist, chairman, commissioner of public works, Grand Rapids, Mich., Donn M. Roberts, vice chairman, city engineer, Terre Haute, Ind., John B. Hittell, chief engineer, department of streets, Chicago, Ill., Henry Maetzel, city engineer, Columbus, O., and Henry W. Klausmann, city engineer, Indianapolis, Ind. Other invited guests for more or less of the trip were H. G. Hawekotte and J. H. Deane, assistant city engineers, Indianapolis; Prof. I. O. Baker, of Illinois University, Champaign, Ill.; Prof. F. H. Eno, of Ohio State University, Columbus, O.; Prof. E. D. Rich, of University of Michigan, Ann Arbor, Mich.; Harry B. Smith and T. A. Randall, of the technical press in Indianapolis. The party was well taken care of by W. P. Blair, secretary, M. W. Blair, W. T. Blackburn, Merle Sidener and local representatives of the paving brick interests in each of the cities visited. The engineering departments of all the cities were untiring in their service as guides and instructors regarding the pavements included in the itineraries.

The famous Speedway at Indianapolis received the first visit. This track, 2½ miles long, was paved last year with Culver blocks, laid with cement filler, according to the specifications recommended by the National Paving Brick Manufacturers' Association, except that the foundation is the old, well-compacted bituminous pavement instead of a new concrete layer. This pavement is an object lesson as to how to build a pavement. It is but a year old and subject to automobile traffic only, and shows no wear, and also no effect of weather conditions. Some excellent pictures of it will be found in vol. xxxvii, p. 348, and one showing removal of board to put in expansion joint is shown herewith.

At Terre Haute a number of pavements with cement and bituminous fillers were seen, showing the effects of good and poor workmanship and materials. The most notable pavements were a part of one on Wabash avenue, accidentally laid some eighteen years ago according to the present best method with cement filler, and South Sixth street, laid shortly thereafter according to a carefully devised specification which has been closely followed, with a few improvements, in all the best work since that time. These streets are smooth and the joints are filled full of cement and wear uniformly with the rest of the street, so that there is none of the rattle of traffic which comes from badly filled joints and rounded tops of bricks. The South Sixth street pavement is shown in an accompanying photograph.

THE INSPECTION PARTY ON LAKE SHORE BOULEVARD, CLEVELAND, OHIO.

Cincinnati had little to show in the way of smooth brick streets, though some, particularly of the later contracts, were well laid and promise long life, though comparatively noisy.

Columbus was in similar condition, except that most of the streets, whether new or old, were in good general condition and showed excellent workmanship and materials except so far as the failure to

SCHAAF ROAD, CUYAHOGA COUNTY, OHIO.

FISHER ROAD, CUYAHOGA COUNTY, OHIO.

KINSMAN ROAD, CLEVELAND, OHIO.

Brick Between Street Railway Tracks. Expansion Joints Every 100 Feet.

fill the joints with permanently solid filler is concerned.

Cleveland apparently learned a dozen years ago to make smooth brick streets by filling the joints with a permanent material, which adheres to the bricks and wears uniformly with them. Cuyahoga county also learned the lesson some years ago, and brick roads laid in the last eight or ten years show the same smoothness of surface and retention of filler in the joints that is so noticeable in the Terre Haute pavement. When the method was demonstrated to be correct it was followed, and consequently Cleveland and Cuyahoga county both boast of several hundred miles of smooth brick streets and roads. The city has some poor brick streets also, and the county has some poor brick roads, but the proportion of poor roads laid since about 1902 is very small.

A fuller description of the Cuyahoga county roads will be given later, space preventing at this time. It must suffice for the present to show photographs of Schaaf and Fisher roads. Schaaf road is 3.16 miles long, of brick, 14 feet wide, on 6-inch slag base, with stone curbs, a few hundred feet on a steep hill being of Medina stone, 8-inch blocks, 18 feet wide. The total cost per mile was $22,425. This road was two years under construction, and was completed in November, 1907. Fisher road is 3.31 miles long and 14 feet wide, has concrete base and stone curbs, and cost $20,664 a mile. It was built in 1908. Both these roads have cement filler in the joints and are in excellent condition.

Another of the accompanying photographs shows Kinsman road, in the city of Cleveland. This is a bitulithic street, with brick laid in the street car tracks. Concrete foundation under tracks and pavement and cement filler show a smooth street. It was thought desirable to put cross expansion joints every 100 feet in the track, and these joints were made by filling with tar three or four wide joints between bricks. These joints are a source of weakness in the pavement, for the excess of expansion in the upper sides of the bricks and the squeezing out of the filler have caused the upper sides of the bricks in the two or three rows with soft filler to be pinched by the expansion of the hundred-foot sections of pavement between expansion joints, and these surfaces have spalled to a considerable extent. This experience is quite different from that reported by Mr. Kingsley at Little Rock. However, the pavement is older, and this concentration of effect on a few soft joints is very evident. The bricks are also doubtless much harder.

One photograph shows Jennings avenue which has a sufficient concrete pavement under street railway tracks to keep the surface in good condition.

A small photograph shows the inspection party on the Lake Shore drive, including the gentlemen named above; Mr. Bayne, Cleveland's engineer of streets; Mr. Barber, Mr. C. C. Blair and Mr. Duty, representing the local brick manufacturers, who supplied much of the material for both city streets and county roads.

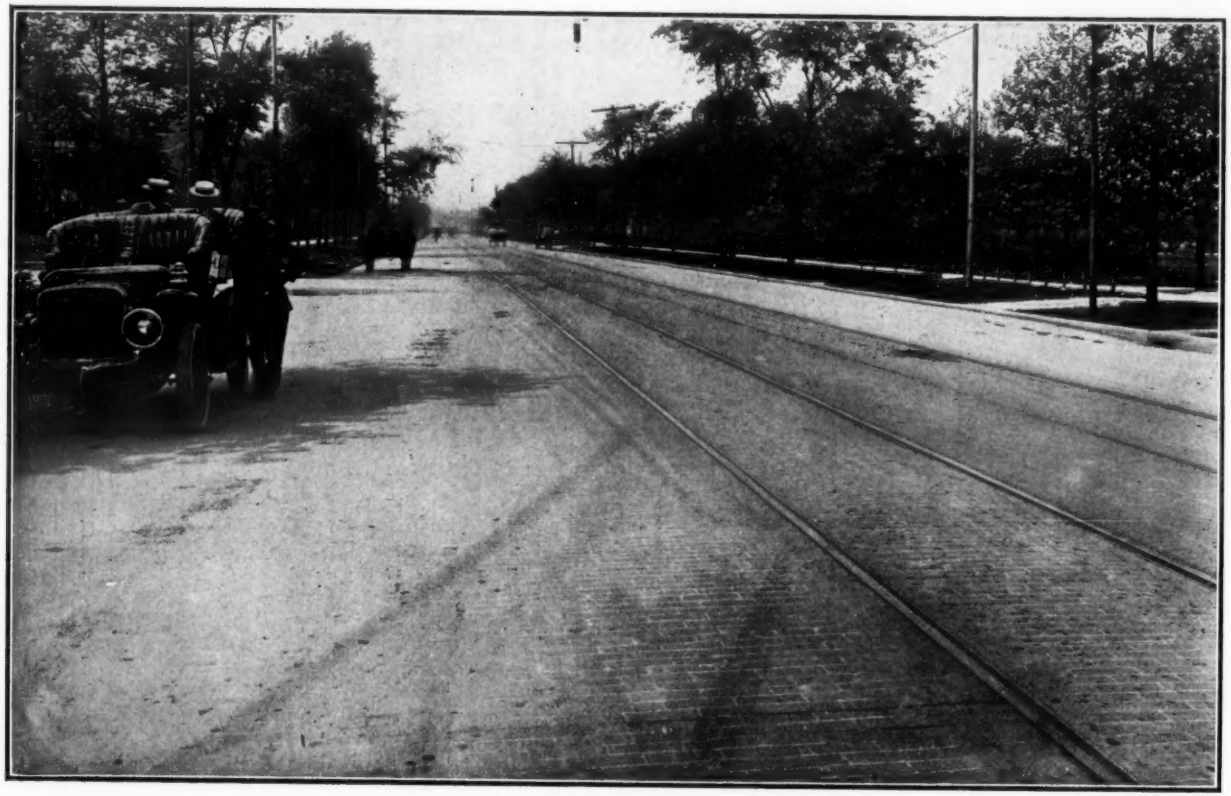
The members of the committees expressed their thanks for the information gathered, and stated that it would materially aid in their work for their respective organizations. The questions arising were thoroughly discussed and the results will be reported from time to time in detail, which is impossible in this article.

The Possibilities of Mathematics.

MUNICIPAL ENGINEERING is doubtless within the bounds of propriety in inserting the following extract from *Harper's Weekly*, taken by a subscriber from the pages of a Sunday school magazine, as a demonstration of the capacity of the mathematical imagination stimulated by recent events in the theatrical world: "In the ballroom of the Hotel Naftaftia, during Christmas week, William R. Spriggs, Ph. D., held a number of fashionable audiences spellbound with his marvelously lucid dances in Euclid and algebra up to quadratics. Perhaps the very acme of terpsichorean art was attained in the masterly fluency of body and limbs by which Mr. Spriggs demonstrated that the sum of all the angles of a triangle is equal to two right angles. In Pittsburg Mr. Spriggs is said to have moved an audience to tears, when, by an original combination of the Virginia reel, the two-step and the Navajo snake dance, he showed that if $x^2+y^2=25$ and $x^2-y^2=25$, $x=5$ and $y=0$. All the pride and selfishness of x, all the despair of y, were mirrored in the dancer's play of features."

National Park at Washington's Crossing of the Delaware.

The Washington's Crossing National Park Commission effected an organization May 27. The commission consists of 50 persons appointed by Governor Fort of New Jersey under an act of last winter. The law creating the new commission provides that it shall have power to acquire and make available for use as a public park such lands as it may locate at Washington's Crossing, as a memorial of the crossing of the Delaware at McConkey's Ferry by General Washington and the Continental troops.



JENNINGS AVENUE, CLEVELAND, OHIO.

Concrete Foundation Under Pavement and Tracks, and Cement Filler.

MUNICIPAL AND TECHNICAL LITERATURE

Springfield, Mass.—London, Ont.—Birmingham, Ala.—Cincinnati, Ohio—Cambridge, Mass.—Books for Engineers

Sewer and Paving Work in Springfield, Mass.

The report of the city engineer of Springfield, Mass., for 1909 contains a detailed account of paving and sewer work under the day labor system; the supervision being in charge of the street and engineering departments. About 12,500 square yards of concrete base, wood block pavement was laid at an average cost for all labor and materials of $3.29 per square yard. Treated gum blocks at $2.10 per square yard were used.

Concrete was used for the construction of all sewers over twenty-four inches in diameter, and collapsible steel forms were used in their construction. All the work was done by day labor.

Pavement Work in Cambridge.

The commission appointed by the city of Cambridge, Mass., to report upon the matter of developing and improving the city of Cambridge, has made a preliminary report, the substance of which is given in the following table.

Pavement Proposed	Name of Street	Location of Improvement	Length	No. of sq. yds.	Estimated Expense	Pavement Recommended
Granite	Charles	3rd to 6th	1170	4369	$14,000	Granite Block
Wood	Prospect	Central Sq. to Austin St.	330	854	1,800	Creosoted Block
Granite	Albany and Erie	Pacific St. to Waverly St.	1150	4200	13,000	Granite Block
Brick	Putnam Av.	River to Mt. Auburn St.	2840	9075	25,000	Brick
Bitulithic	Mt. Auburn	Sparks to Coolidge Av.	2500	11000	25,000	Bitulithic
Bitulithic	Mass. Av.	Sacrameto St. to Waterhouse St.	1700	10580	24,000	Bitulithic
		Total	9690	40078	$202,800	

Paving and Sewer Work in Birmingham.

Birmingham, Ala., is engaged in putting through about $250,000 worth of paving this summer, in addition to about $250,000 worth of sewer work which is just being completed. The paving work includes 42,350 square yards of bitulithic pavement, to cost the property owners about $1.85 per square yard; 9,600 square yards of brick pavement, to cost the property owners $1.90 per square yard, and 38,750 square yards of bituminous binder pavement. Of the latter class, which is being constructed for light traffic, 19,050 square yards is to cost 65 cents per square yard, and the other 19,700 square yards is to cost only 52 cents per square yard. The reason for the extreme cheapness of the last named division is due to the fact that city prison labor is to be employed.

Cincinnati Water Works.

In a report submitted to General Superintendent Laidlaw, of the Cincinnati water works, by Operation Superintendent Pollard, the latter asks for an appropriation of $60,000 to replace twelve boilers at the main pumping station. The boilers are said to be inadequate, and it is necessary to operate them at a steam pressure approaching the danger limit.

Mr. Pollard also recommends the universal adoption of meters in an effort to prevent the unnecessary waste of water. He calls particular attention to the fact that the pumpage has increased nearly 12½ per cent. over that of the corresponding months of 1909.

Making the water do some work which will save the city money is outlined in a suggestion of Pollard that the water power, estimated at 200-h.p., in the fall of water between the settling reservoirs and the coagulation basins, be utilized for generating electric current.

Water Meters in London, Ont.

The commissioners of London, Ontario, have been able, as a result of adopting

meters for the water supply, to reduce prices as much as 50 per cent. The rental of all meters up to one inch has been cut in half, while, at the same time, the minimum price of the water has been reduced. Chairman McMahon is of the opinion that if meters had been adopted earlier, the recent extensions to the water system would not have been necessary.

Books for Engineers.

Baldwin on Heating, or steam heating for buildings revised, being a description of steam heating apparatus for warming and ventilating large buildings and private houses, with remarks on steam, water, and air, in their relation to heating; to which are added useful miscellaneous tables. By William J. Baldwin, M. Am. Soc. C. E., and M. E. Sixteenth edition, revised and enlarged. Cloth, 404 pp., with many illustrations. $2.50. John Wiley & Sons, New York.

The first edition of this book was written in 1878, and it has been revised in 1897 and in 1908, being now brought down to date. It is a practical book, but little given to theory which cannot be applied directly to the practical work of the builder of heating systems for buildings large and small.

One chapter is devoted to the gravity circulation apparatus. The radiators and heating surfaces are considered in two chapters; boilers and their settings in five; various appurtenances, such as grates, chimneys, draft regulators, feeders, valves, piping, in sixteen; steam and its treatment in heating apparatus in ten.

The book will be found very convenient by the engineer wishing data for estimates as well as by the steam heating designer and contractor.

Solid Bitumens, their physical and chemical properties and chemical analysis, together with a treatise on the chemical technology of bituminous pavements. By S. F. Peckham, A. M., chemist to the department of finance, city of New York, member of American Philosophical Society, Society of Chemical Industry, American Chemical Society, American Institute of Chemical Engineers, etc. Cloth 324 pp., $5 net. The Myron C. Clark Publishing Co., New York and Chicago.

The author has had many years, about fifty, of experience with bitumens and has long been well known in the literature of the chemistry of bitumens. Some years ago he made some very valuable contributions to the discussion of the technology of bitumens in the pages of MUNICIPAL ENGINEERING.

After a brief historical introduction, the author gives a brief geographical classification of bitumens, with some reference to the geological ages of deposits. He summarizes the controversies over the origin of bitumens and concludes that various deposits have various origins and have been formed in various ways, all of which have been demonstrated more or less correctly and accurately by those engaged in the discussions.

The classification of bituminous substances is on the basis of bitumens, which include natural gas, petroleum, maltha, and asphalt; pyrobitumens, which include coal, bituminous shales and schists; and artificial bituminous substances which are direct products of the arts or by-products of manufacture. Evidently this is but one of several possible systems of classification. The title of the book limits the author to the consideration of the solid bitumens under his three classes.

There has been much controversy also over the derivation of bitumens and the author again sums up the contributions to the discussions, regarding the derivation of natural solid bitumens by evaporation, decomposition, and polymerization; of bituminous rocks; of artificial solid bitumens.

The second part gives a fairly satisfactory statement of the state of the chemical technology of bitumens, admitting in the first sentence that there are few subjects of equal importance about which chemists know so little. He begins with Boussingault's memoir of 1837, discusses with some warmth the use and misuse of the terms petrolene, asphaltene, retine, etc., and passes to the various analyses of solid bitumens. One chapter on the ultimate analysis refers to well known methods and gives the author's own methods for determination of carbon, hydrogen, sulphur, oxygen and nitrogen.

Another chapter on the proximate analysis gives methods of distillation, which are applicable but slightly to solid bitumens; methods of solution in carbon disulphide, petroleum ether, turpentine, chloroform and hydrochloric acid; with reference to Trinidad Pitch Lake of the gas, lake water, aqueous and alkaline solutions of the pitch; consideration of the residual organic and mineral matters.

The technical analysis is one in which comparatively little work has yet been done. It is considered in a chapter, giving methods of distillation and solution of other asphalts than Trinidad Lake, quoting the methods of other chemists and giving in detail the author's own recommending solvents of fixed purity, such as alcohols of at least 95 per cent. purity, acetone, ethyl ether, chloroform, and perhaps carbon tetrachloride and acetone. This discussion, he says, must be inconclusive, the field of chemical research in this line being a field as yet but little worked.

The modern problem for the chemist who is keeping track of the materials used in street paving is the distinguishing of solid bitumens in mixtures. The special chemical and physical methods of analysis by which this can be done are described in a chapter giving methods of determining fixed carbon, preparation of street mixtures for the determinations, tests with fuming sulphuric acid, alcohol and alcohol-benzine, the precipitation

method, determination of paraffine, distinguishing between artificial asphalts, the use of the microscope and spectroscope.

Analyses of asphalt blocks and concretes, creosoted and wood paving blocks are discussed in a chapter which also contains the various methods of chemical analysis of cements, limestones, cement mortars and concretes which are used in the foundations of bituminous pavements.

A third part of the book is given to the physical properties of solid bitumens, and explains the tests for specific gravity, softening point, melting point, flow, ductility and penetration.

The fourth part on the chemical technology of bituminous streets is not as satisfactory as the rest of the book and does no compare favorably with the chapters in the recent books on paving and paving materials on the same subjects, viz., foundation, asphalt surface, bitulithic, oiled roads and streets, asphalt blocks and wood blocks.

The chapter of conclusions lays down the requirements of a solid foundation; bitumen not acted on by water or protected from action by water; clean, dry, rough concrete surface; binder course one inch in thickness; sharp sand with proper proportion of fine sand, dust or Portland cement, bitumen selected for climate.

A Treatise on Concrete, Plain and Reinforced, materials, construction and design of concrete and reinforced concrete. With chapters by R. Feret, William B. Fuller, Frank P. McKibben and Spencer B. Newberry. By Frederick W. Taylor, M. E. Sc. D., and Sanford E. Thompson, S. B., Consulting Engineer. Second edition, total issue, 11,000 copies. Cloth, 847 pp., 249 plates and diagrams, $5. John Wiley & Sons, New York.

A full review of the first edition of this book was printed in MUNICIPAL ENGINEERING, vol. xxx, p. 61. The present edition is practically the same as regards methods of construction and examples of structures. It has been thoroughly rewritten as regards the theoretical discussions and the methods of design.

Since the appearance of the first edition there has been great activity in the study of concrete, and many laboratory experiments and actual structures have been made, which have very materially added to our information, especially regarding reinforced concrete work. Numerous engineers have devised new systems of reinforcing and have made great improvements in the application of the older systems, so that both theoretically and practically there has been great improvement in methods of design and construction. An enumeration of the improvements in this second edition of the book will be very nearly an enumeration of the advances in the theory of concrete and reinforced concrete.

The more general classification of fine aggregates and coarse aggregates is adopted. The treatment of methods of placing concrete, joints and surfaces is somewhat improved. Mr. Eckel's sub-classification of Portland cements as normal, low and high iron content is inserted. The water for concrete, compression strength, tests of sand, density of mortars and concrete, and experiments thereon, coarse and fine sand, dust, and other impurities in aggregates, filling voids with fine material, mica in sand, methods of proportioning concrete, by arbitrary selection of volumes, by void determination, by French rules, and as to amount of cement, mechanical analysis diagrams, mixing concrete, forms for mass concrete, effect of sea water on concrete and mixtures of puzzolan and slag with cement for use therein, fire resistance and protection of reinforcement from heat and rust, lime, clay, asphalt for making concrete structures waterproof, and other methods of affecting permeability, tests of concrete columns, concrete in shear, effects of oils and electrolysis on concrete, are some of the subjects in which progress is reported. The tables of quantities of materials in mortar are separated into two, one for ordinary coarse bank sand and one for very fine sand.

The principal additions to the book are in the chapters devoted to the theory of concrete design, particularly of reinforced concrete. These have increased the size of the book 81 pages in the chapter on reinforced concrete design, a new chapter on arches and some additional appendices, to which some of the demonstrations of formulae have also been transferred. These chapters have also been rearranged and the tables to which objection was made in the former review have been taken out.

The additions to the text of the chapter on design include discussions of the modulus of elasticity of concrete, elongation, quality of steel, formulae for designing rectangular beams, slabs, T-beams, beams with steel in top and bottom, continuous beams and slabs, formulae and diagrams for determining shear and bending moments, diagonal stresses and reinforcement therefor, stirrups, bond of steel and concrete, bends in horizontal reinforcement, spacing of bars, hooked bars, columns, temperature and shrinkage stresses. There are also examples of designs for beams, flat slabs, hooped and other columns. A dozen names are added to the list of systems of reinforcement. Tables are supplied for dimensions of bars and rods, for determining loads and stresses in supported and continuous beams, slabs, cinder concrete slabs, beams with steel in top and bottom and flat slabs, for reviewing designs, for the constant in formulae for depth and moment of resistance of beams, for effect of different percentages of reinforcement, for proportional depths of neutral axes. Diagrams for some of these tables are also supplied. The latest official recommendations for working stresses in reinforced concrete are given,

and the common formulae for beams, columns and reinforcement are collected at the end of the chapter.

The chapter on arches is a concise statement of the elastic theory and a simplified method of applying it to arch design, with an example occupying over 50 pages, with a half dozen additional pages on erection and showing notable arches.

The chapters on concrete structures, showing practice, are practically unchanged, the additions being theoretical discussions of the design of a reinforced concrete chimney, reinforced concrete foundations and footings, earth pressure, and reinforced concrete retaining walls of various forms of cross-section, conduits, and storage reservoirs. One chapter gives a list of a dozen or more prominent special uses of concrete.

The new references to books and articles on concrete are added to the various lists, so that the new list is distinguished from the old, and, in addition to its convenience, shows graphically the relative amount of discussion of the various subjects heading the lists.

The partial reference indexes on the inside front cover in the first chapter and elsewhere will be found very convenient, and there is also a complete index.

The authors have evidently decided to confine their attention to the advances in the knowledge of the theory and design of concrete structures, and have brought the book well up to date in this regard. Nothing has been omitted from the descriptive chapters and they are quite as satisfactory as in the first edition.

Modern Baths and Bath Houses. By Wm. Paul Gerhard. 327 pp., 130 figures; cloth, $3, net. John Wiley & Sons, New York, N. Y.

The author has prepared a handsome and quite comprehensive book upon a subject which is of growing importance in the public eye, for it is largely devoted to public baths of various sorts. Aside from the plumbing features, the entire field is covered in the text, and this is really quite well taken care of in the specifications for a municipal bath house, which are given in one chapter. There are some repetitions, occasionally even triple repetitions, on account of the insertion of papers and articles written by the author at various times, and quotations from other authors, which are not edited with a view of saving space in the book and the time of the reader, but otherwise the original work of the author and his selections from others have been done very satisfactorily. He evidently speaks from practical experience and much observation of conditions in this and other countries.

The first chapters give some historical notes and general statements regarding the purposes and various forms and media for baths. The fourth chapter describes in detail "The Modern Rain Bath," and nearly every subsequent chapter continues and reiterates again and again the arguments in favor of its adoption under almost every condition. The next succeeding chapters describe baths in private houses and tenements, public bath houses in foreign countries, people's baths, including public and semi-public baths open to the public without charge or with a very small charge, both at home and abroad, factory and workingmen's baths, school baths, baths for military barracks, armories, prisons, jails and police stations, for hospitals, for club houses, gymnasiums, hotels and barber shops. There is also a short chapter on river and sea baths, and there are others on air and sun baths, medical and electric-light baths.

The chapter on water supply and plumbing of bath houses is brief and to the point, rather general in its nature, but showing some valuable appliances and giving the detailed specifications referred to above.

The work closes with a bibliography of English, American, German and French books, reports, pamphlets and articles on all phases of the subject, and an appendix giving extracts from various authors describing methods of bathing in Russia, Scandinavian countries and Japan, and a description of the German baths for dogs.

The book is handsomely illustrated, and will be of much assistance to the rapidly increasing number of municipal officials and public-spirited manufacturers and other citizens who are agitating and actually accomplishing the introduction of methods of keeping clean to those who cannot install bath rooms in their own houses or find them in the habitations they are able to rent.

Development and Electrical Distribution of Power. By Lamar Lyndon. Cloth, 323 pp., $3 net. John Wiley & Sons, New York.

The author disclaims any intention of writing a text-book on his subject, but has made a very convenient compendium of the steps to be taken in investigating the utilization of a water power in the production of electricity and its transmission to a distance. The first 150 pages or so are devoted to the statement of the author's method, with practical and somewhat detailed working out of some of the steps, and the remainder of the book is filled with descriptions of nine prominent hydro-electric power plants, taken from the technical periodicals and condensed to a greater or less extent.

The treatment of the chapter on electrical equipment apparently presumes an intimate knowledge of electrical theory and construction, while that of the hydraulic development is given over to comparatively simple details, seemingly with the assumption that the electrical engineer is not familiar with these principles and needs to be led by the hand through them. It is evidently not possible to produce a complete treatise within the limits of 70 pages, and the author refers to the text-books on hydraulics for more

thorough treatment. He falls readily into the short speech of the practical electrician, which is not always strictly correct, but stands for the correct statement with those who are versed in the "slang" or "lingo" of the profession.

On account of his restriction of his treatment to the one theme, the author has produced a practical book, which will be a great convenience as a guide to the engineer who comes fresh to this sort of problem, as well as for a reminder to the one who is practiced in it.

Domestic Sanitary Engineering and Plumbing, dealing with domestic water supplies, pump and hydraulic ram work, hydraulics, sanitary work, heating by low pressure, hot water, and external plumbing work. By F. W. Raynes, R. P. Cloth, 474 pp., $3 net. Longmans, Green & Co., London and New York.

The plumber and sanitary engineer are one and the same man in England, and this book covers both fields so far as individual houses are concerned. Much detailed instruction is given in plumbing materials, their properties and mode of manufacture, roof work, pipe fixing, bending and joints, solders, fluxes and lead burning, sanitary fittings and accessories, soil and waste pipes. Then the design of drainage systems for houses, the disposal and treatment of sewage from country houses, their water supply, methods of raising water, are discussed, and the last chapters, after one on the elements of hydrostatics and hydraulics, take up the domestic hot water supply, and low pressure hot water heating apparatus.

If the chapters on plumbing are supplemented by some such book as Starbuck's "Modern Plumbing" ($4), giving examples of American practice, this book will be the most complete and detailed upon its subject which is on the market.

The sanitary engineer who has country residences and unsewered parts of cities in his practice will find the chapters on sewerage, sewage disposal and water supply particularly satisfactory, if he will make the one modification made necessary by the more liberal supplies of water provided in this country.

American Playgrounds, their construction, equipment, maintenance and utility. A compilation of serviceable information concerning what has been and what should be done to provide suitable recreation and rational physical training by approved modern methods for the benefit of the people. A practical manual for supervisors, instructors, committees and others desiring knowledge of how and what to do. Edited by Everett B. Mero, with special contributions and extracts from writings of a dozen named experts in the work, and other authorities. Cloth, 270 pp., $1.70 net. postpaid. American Gymnasia Co., Boston, Mass.

The book is all that its title page promises, and more, for it imparts the enthusiasm which is in every line of the writing of both editor and those from whom he quotes. It is the first book of the kind in the English language, and it covers the field so thoroughly that no other book will be needed until the movement, which is now becoming so popular, has developed beyond the limits now reached in any of its manifestations.

The various parts go into detail in their chapters, regarding how and why to provide for general exercise and recreation; organization, construction and equipment of playgrounds; special points for supervisors and instructors; games and exercises for children and grown-ups; the Chicago method in action; miscellaneous information, a number of quotations and extracts, and a list of available books.

The promoter, organizer or supervisor of a playground movement will find the book all but indispensable. It can be obtained of the Dale Association, Back Bay, Boston, Mass.

A Text-Book on Roads and Pavements. By Prof. Frederick P. Spalding. 350 pp., cloth, $2. John Wiley & Sons, New York, N. Y.

Professor Spalding has in this third edition brought down to date a book which was first published in 1894, and he has increased its size more than 50 per cent. in the process. As a text-book for a class in this subject it should be very satisfactory. It is not so complete nor so thorough as the treatises prepared by several other authors, but in general it follows good practice and is an excellent guide in the study of the subject.

The chapters treat of road economics and management, drainage of streets and roads, location of country roads, improvement and maintenance of country roads, broken stone roads, foundations for pavements, brick, bituminous, wood block and stone block pavements, and city streets.

It will be seen that roads have a large share of attention, practically half the book being devoted to them and the other half to street pavements.

The increase in knowledge about road-making and street paving will be shown very well by a brief enumeration of the principal subjects which cause the increase in the size of the book by introducing new material, and which require rewriting of other sections. With reference to roads they are: Size of wheels, width of tire, cost of wagon transportation, economic value of road improvement, sources of revenue, road management, sub-surface drainage, concrete culverts, design of roads, earth work, earth, gravel, oiled, petrolithic, sand-clay, and miscellaneous roads, modern road specifications, road making materials and tests thereof, binders, road maintenance, bituminous macadam. With reference to pavements they are: Trenches in pavements, gravel, broken stone, concrete and bituminous foundations, qualities and tests of paving brick in detail, construction of brick pavements in detail, chemical constitution of bitumens, brief descriptions of the various asphalts, asphaltic cements and surface

mixtures, tests for asphalt cement, binder and surface courses of asphalt pavements, bitulithic pavements, the modern wooden block pavement, specifications and tests for creosoted wood blocks, construction of wood block pavement, specifications for granite blocks and fillers for block pavements, cross-sections of streets and alleys, concrete sidewalks, curbs, gutters and crossings, street railway tracks, selection of pavement, durability of various surfaces, sources of revenue.

While there are chances for difference of opinion upon some of these subjects, it is evident that the author has kept pace with the advancement in paving knowledge and methods.

ORGANIZATIONS AND INDIVIDUALS

Smoke Inspectors—Cement Shows—National Municipal League—International Municipal Congress—Technical Meetings—Civil Service—Bureau of Mines—Technical Schools—Personal Notes

The Smoke Inspectors Convention.

The fifth annual convention of the International Association for the Prevention of Smoke was held in Minneapolis on June 29 to July 1, inclusive. The papers which were read were: "The Harrington Automatic Stoker," by Mr. Joseph Harrington, of Chicago; "Forced Draft and Its Relation to Combustion," by Mr. C. F. Hodges, of Hyde Park, Mass.; "The Taylor Stokers and Steam Boiler Efficiency," by Mr. R. S. Riley, of Providence, R. I.; "Gas Producers as Related to Smoke Prevention," by Prof. R. H. Fernald, in charge of U. S. Geological Survey office at Cleveland, O., and "Furnace Draft in Its Relation to Smoke Prevention," by Mr. Sylvester S. Howell, of Chicago.

The officers elected for next year were: Mr. Paul Bird, of Chicago, president; Mr. Malone, of New York, N. Y., vice president; Mr. Harris, of Toronto, secretary and treasurer.

The place of meeting for 1911 is New York City and for 1912 is Indianapolis, Ind.

The New York and Chicago Cement Shows.

It is announced that the first annual New York cement show will be held in Madison Square Garden, December 14-20, 1910, and the fourth annual Chicago show will be held in the Coliseum, February 17-23, 1911. The show at New York is the first venture in that city, but it is believed that the show there will prove quite as successful, if not more so, than the annual Chicago cement show.

The Cement Products Exhibition Company has already promised that the New York show, as well as the next Chicago show, will have a somewhat different aspect from previous cement shows. It is expected that there will be some change in the general character of the exhibitors. Many of the larger construction companies have become interested in the possibilities of the shows, and as a result will have on display some most unusual and valuable exhibits, with the idea of interesting the business man and the public generally in the advantages of reinforced concrete construction.

The National Municipal League's Annual Meeting.

The next meeting of the National Municipal League will be held in Buffalo, November 14-18, at the invitation of the Buffalo Chamber of Commerce. Among the questions to be considered are: The unearned increment in municipalities; the use of schoolhouses as civic centers; the significance of recent revelations of graft; how can graft be overcome and eliminated; the necessity for uniform accounting and budgets; the importance of a municipal balance sheet; recent franchise settlements; electoral reform; municipal health and sanitation.

The International Municipal Congress and Exposition.

The International Municipal Congress and Exposition is to be held in the Coliseum at Chicago, on September 18 to 30, inclusive, 1911. In connection with the exhibits will be installed comprehensive displays and the practical operation of machinery and appliances used in all branches in every modern municipal undertaking, with particular attention given

to such exhibits as illustrate modern methods of city cleaning, sanitation and public improvements. Among other classes of exhibitors who already have made application for space, will be the manufacturers of material used in building construction, engineering, paving, road making, parks and playgrounds, street lighting, transportation systems, telephones, garbage collection and disposal, street cleaning and sprinkling, fire and police organization and equipment, water works, sanitation and health, hospital, school and library appurtenances, municipal office requirements, and, in fact, everything that enters into the building and upkeep of municipalities everywhere.

Technical Meetings.

The annual meeting of the American Public Health Association will be held at Milwaukee, Wis., September 5, 6, 7, 8 and 9. W. C. Woodward, secretary, Washington, D. C.

The annual meeting of the Association of Edison Illuminating Companies will be held at Thousand Islands, N. Y., September 6, 7 and 8. Walter Neumuller, assistant secretary, 55 Duane street, New York City.

The annual convention of the International Association of Municipal Electricians will be held at Rochester, N. Y., September 6, 7, 8 and 9. Frank P. Foster, secretary, Corning, N. Y.

The annual meeting of the Michigan Gas Association will be held September 6, 7, 8 and 9, on board steamer sailing from Detroit, Mich. Glenn R. Chamberlain, secretary, Grand Rapids, Mich.

The annual convention of the Colorado Electric Light, Power and Railway Association will be held at Colorado Springs September 21, 22 and 23. J. C. Lawler, secretary, P. O. Box 938. Colorado Springs.

The annual convention of the New England Water Works Association will be held at Rochester, N. Y., September 21, 22 and 23. Willard Kent, secretary, Narraganset Pier, R. I.

The annual meeting of the National Irrigation Congress will be held at Pueblo, Colo., September 26, 27, 28, 29 and 30. Arthur Hooker, secretary, Pueblo.

The program for the tenth annual convention of the Texas Mayors' Association held at Tyler, Texas, July 28 and 29, included the following: "Municipal Problems," Capt. Paddock, Ft. Worth; "Commission Form of Government," Mayor Fisher, Galveston; Mayor F. C. Highsmith, Mineral Wells; Mayor G. C. Bird, Greenville; A. B. Loach, Texarkana. "Initiative, Referendum and Recall," Mayor Atchison, Denison; Commissioner Mulkey, Ft. Worth; "Building a City," Mayor H. Baldwin Rice, Houston; "The City Beautiful," George E. Kessler, park expert, Kansas City; "How to Keep Municipal Improvements of Western Texas Cities Apace with Their Rapid Growth," Mayor Malanchette, Stanford; J. R. Delay, Plainview; T. D. Mathews, Haskell; J. N. Haney, Canyon City; "Municipal Improvements in Eastern Texas Towns," Mayor John H. Bonner, Tyler; T. S. Caven, Marshall; Y. L. Charles, Teague; B. F. Sherrell, Jefferson; Mayor Bodenheimer, Longview; "Municipal Sanitation," John B. Hanley, Texas; "Water Meters and Their Economy," Paul Hamilton, New York.

The convention of the International Association of Fire Engineers will be held in Syracuse, N. Y., on August 23, 24, 25 and 26.

The Civic League of St. Louis has issued a booklet advocating the establishment of an outer park system for the city.

The League of American Municipalities will hold a meeting at St. Paul on August 23, 24, 25 and 26. The program will include the following papers of interest to engineers: "Collection and Disposal of City Waste," by Dr. P. M. Hall, of Minneapolis; "The Street Paving Problem," by Hon. Martin Behrman, of New Orleans, Mr. Frank F. Fowler, of Chicago, and Mr. E. R. Schreiter, of Detroit. John MacVicar, secretary, Des Moines, Iowa. A municipal exposition will be held in connection with the meeting.

The annual meeting of the American Society for Testing Materials was held at Atlantic City, N. J., on June 28 to July 2. The reports of the Committee on Standard Methods of Testing and the Committee on Standard Specifications for the Grading of Structural Timber were accepted by the convention; and the report of the Committee on Standard Tests for Road Material was accepted subject to the result of a letter ballot. The Committee on Standard Specifications for Paving Brick presented a progress report in which it was stated that no specifications would be presented until further data were obtained. In addition to the committee reports there were presented some 35 technical papers on matters connected with the composition, manufacture and testing of materials.

The Federal Bureau of Mines.

The act establishing a Bureau of Mines in the Department of the Interior, approved May 16, 1910, became effective July 1. As originally approved, the law contemplated the transfer of the entire technologic branch of the United States Geological Survey, the mine accident investigations, fuel investigations, structural materials investigations, the entire personnel, property and equipment, to the Bureau of Mines, but the sundry civil appropriation act, approved June 25, amended the law to such an extent that the structural materials investigations, including the personnel and equipment for these investigations went to the Bureau

of Standards, Department of Commerce and Labor.

The last of the bulletins of the technologic branch to be published by the Survey will be issued from the Government Printing Office about August 1. This bulletin relates to the explosibility of coal dust, and was prepared by G. S. Rice, with chapters by J. C. Frazer, Axel Larsen, Frank Haas and Carl Scholz.

The first of the Bureau of Mines bulletins, "The Volatile Matter of Coal," by H. C. Porter and F. K. Ovitz, will be published in the next few months. Then will follow "Coal Analyses," by N. W. Lord and J. S. Burrows; "Final Data Regarding Steam Tests," by L. P. Breckenridge; "North Dakota Lignite as a Boiler Fuel," by D. T. Randall and Henry Kreisinger; "Producer Gas Tests in 1905-1907," by R. H. Fernald; "The Coke Industry as Related to the Foundry," by Richard Moldenke; "Coals for Illuminating Gas," by A. H. White and Perry Barker, and "Petroleum for Combustion Under Steam Boilers," by I. C. Allen.

These publications, when issued, can be obtained by addressing the director of the Bureau of Mines, Washington, D. C.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

August 10-11—Aid in the Coast and Geodetic Survey, at $720 and upwards. Deck officer, at $900 and upwards.

August 24-25—Draftsman (marine engines and boilers), at $1,800.

The Technical Schools.

"Tests of Timber Beams," by Arthur N. Talbot, issued as Bulletin No. 41 of the Engineering Experiment Station of the University of Illinois, is a detailed report of the tests of a large number of full-size timber bridge stringers. The test beams included new, seasoned, and creosoted wood of several species. The report also gives the results of shear and bending tests on specimens cut from the large beams. Important conclusions concerning strength and other properties of structural timber are given.

It is a recognized fact that practical work along engineering lines, even in the subordinate positions, gives the young technical student better insight into his school work, and fits him to be of use to his employer upon graduation. In accordance with this idea the University of Pittsburgh has entered into an agreement with various industrial concerns, so as to offer the student summer employment along the lines which he is following in his school work. In this way the student follows a line of employment during the summer which is fitted to his own abilities and which prepares him for further advancement. While in the employ of these industrial concerns he is classed as an employee and receives an apprentice's wages in addition to university credits given upon the submission of a written report of the summer's work. The plan will be put into operation October 1, 1910.

Delaware College, of Newark, Del., has issued its catalogue as one of its regular quarterly bulletins. Courses in science, art, agriculture and engineering are offered by this college.

Personal Notes.

R. S. Alexander has been elected city engineer at Clarksville, Tenn.

Hon. T. C. Thornton, mayor of Warrenton, Va., died at his home, July 11, aged 70 years.

Charles G. Armstrong has been appointed consulting engineer in the department of bridges of New York City.

August Forsberg, who was city engineer of Lynchburg, Va., died July 15, at his home in that city, aged 79 years.

Mr. Frederick A. Mallette, former president of the board of public works of Geneva, N. Y., died at his home in New York City, July 16.

Hugh Crozer, of Knoxville, Tenn., has resigned as chief engineer of pike road work in Coche county, and is succeeded by Herbert Holt, of Newport, Tenn.

William Wood has resigned as chairman of the Cooke county pike commissioners, at Newport, Tenn., and John Weaver has been elected to succeed him.

W. E. Conner and A. A. Hanscom have been appointed junior engineers in the United States Reclamation Service, and have been assigned to the Milk River project.

H. B. Pearson, Jr., has been appointed city engineer at El Centro, Cal. The city engineer is made ex-officio superintendent of water and sewers and superintendent of streets.

James B. Faulks, Jr., Jun. Am. Soc. M. E., associate professor in the College of Engineering of Syracuse University, died at Syracuse, N. Y., July 15, of typhoid fever, aged 38 years.

Mr. John Finan has accepted a position with the Kaps-Brehm Company, engineers and contractors, of Cincinnati. He is at present in charge of a contract for the Gest Brewing Company, of Nashville, Tenn.

Mr. Walter B. Snow, publicity engineer, Boston, Mass., has added to his staff Mr. H. Ross Callaway, a graduate of the Massachusetts Institute of Technology, and late assistant to the mechanical engineer of the New York Edison Company.

Robert A. Howard, for the past twenty-four years surveyor of Wayne county, died Thursday, July 21, at his home in Richmond, Ind. Mr. Howard was 81 years old. Since 1886 Mr. Howard had been surveyor, without opposition at any election.

The department of public works of Paterson, N. J., has issued a pamphlet containing the accepted form of proposal, agreement and specifications for all paving work. Mr. H. J. Harder is the city engineer of Paterson, and to him is due the credit for the work.

On account of the anxiety caused by the prevalence of typhoid fever in Milwaukee this summer, the city council has requested Messrs. Harrison P. Eddy, of Boston; John W. Alvord, of Chicago, and Geo. C. Whipple, of New York, to hasten their report on sewage disposal. The sewage of Milwaukee is discharged into

Lake Michigan, and the water supply is taken from the lake at a distance of 1½ miles from the shore and 60 feet below the surface.

Miss Helen Hamilton, of Detroit, who is a student in engineering at the University of Michigan, believes an energetic young woman ought to be as successful in bossing a gang of men as in bossing a room full of school children. Sewer building will be her specialty.

Calvin H. Vanauken, 74 years old, a widely known civil engineer, was killed July 19, in Auburn, Ind., when the carriage in which he was driving across the Lake Shore Railway tracks, was struck by a passenger train. Mr. Vanauken was once surveyor of Dekalb county and was a pioneer.

Silas G. Comfort, Assoc. M. Am. Soc. C. E., vice president and professor of engineering of Pennsylvania Military College, Chester, Pa., was found dead, July 13, in the shallow waters of a small creek near Chester. His death was, in the estimation of the coroner, accidental. Mr. Comfort was appointed consulting engineer for the city of Chester in regard to new sewers, paving and water supply, about one week before his death.

MACHINERY AND TRADE

The Stedman Estimeter.

The Stedman Estimeter, shown in the accompanying photograph, is a mechanical device for measuring and adding lines. The method of operation is simple, the results obtained are accurate, and either straight or curved lines may be measured. The instrument is held in a perpendicular position, with the arrow pointing to the place where the measurement starts. By traversing over the lines to be added, the

total number of feet will be indicated on the dials at a scale of ¼ inch to the foot. Measurements of other scales may be obtained by proportion. A slight pressure on the push button to the right of the dials restores all the dials to the starting point.

The instrument may be obtained from the Stedman-Johnson Manufacturing Company, of Cleveland, O.

The Harrison Integral Method of Waterproofing Concrete.

The "Harrison Integral" method is the name applied to the process of waterproofing concrete by adding "Harrison Compound" to the cement and aggregate in the mixer. The "Harrison Compound" is a water repellant, impalpable powder, which, when added to concrete, causes the mass to become so dense that no water can be forced through at any normal hydrostatic pressure. As the name implies, the compound becomes an integral part of the mass, and its properties last as long as the concrete of which it is a part. The nature of the compound causes it to be an aid rather than a detriment to the strength and cementing quality of the concrete, and it does not in the slightest degree retard the final setting.

The method of using the compound is simple and involves little extra trouble. The compound in the proportion of eight pounds for every barrel of Portland cement is placed in the mixer with the cement and aggregate and the mass is mixed dry, one or two turns of the mixer being sufficient to insure a thorough incorporation of the compound. In the case of hand mixing the compound is mixed dry with the cement.

The compound is manufactured by the Harrison Water-proof Materials Company, of New York City.

The Polygon Concrete Mixer.

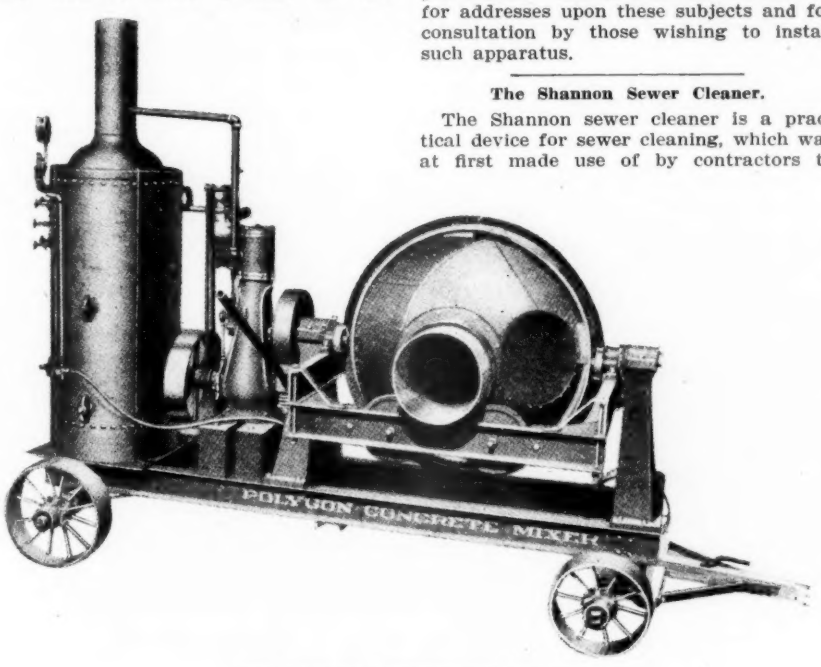
The fundamental requirement, for strength in concrete, is that each particle of sand and rock shall be thoroughly coated with cement. All engineers of today are agreed that concrete cannot be as thoroughly mixed by hand as by the more approved form of concrete mixers; and these mixers vary in the results they obtain according to the principles upon which they are designed.

In the polygon concrete mixer there is an application of the best principles developed up to the present time. The material, in passing through the mixer, is thrown endwise and sidewise alternately, toward and past the center. It allows no settling of particles of materials and it brings about a uniform distribution of moisture, which prevents spots and uneven appearances, sometimes seen in machine-mixed concrete. The construction of the drum (see accompanying photograph) does not permit of corners

nor crevices becoming filled with material which afterwards hardens. In other words, the machine is easily cleaned.

By means of the blades in the interior of the drum, the particles are thoroughly intermingled as to size, thus overcoming an objection present in some other mixers—that of the gravitation of the cement and finer particles to the bottom of the mass. These blades are fastened to the drum with sufficient projection to avoid the secreting of concrete.

Not the least among the advantages of the drum is the rapidity of its action. The red oxide of iron test shows that in ten revolutions of the drum, or less than thirty seconds, every particle of the



THE POLYGON CONCRETE MIXER.

charge is coated, and the batch is of a uniform tint.

The machine is a batch mixer, and the discharge of material may be regulated even while the machine is running at full speed. The outlet is so arranged that it is unnecessary either to build a runway or to excavate in order to facilitate dumping into a wheelbarrow. The tilting is controlled by one man, who also controls the loading of the charge.

The polygon mixer is made by the Waterloo Cement Machinery Corporation, Waterloo, Ia. Catalogues and full information will be sent upon request.

Garbage Reduction.

Col. Wm. F. Morse, consulting sanitary engineer, 111 Broadway, New York, has been longest in the work of garbage destruction of any engineer in the country. He is now engaged in the designing of special forms of crematory furnaces for the waste of railway stations, public institutions, hospitals, hotels and private business establishments, special attention being given to the equipment for disinfection and for the disposal of refuse from tuberculosis hospitals and sanitariums and from medical schools and colleges. He has installed many such plants, as well as many others for municipalities. He has made a summary of the present condition of the subject in his book on "The Collection and Disposal of Municipal Waste." His services can be secured for addresses upon these subjects and for consultation by those wishing to install such apparatus.

The Shannon Sewer Cleaner.

The Shannon sewer cleaner is a practical device for sewer cleaning, which was at first made use of by contractors to facilitate their work, but, through its merit, has become so popular as to warrant its being placed on the market. The cleaner consists of a trough with rounded, shovel-shaped ends and a cover and flap valve. To operate it a rope is passed through the sewer from one manhole to the next. This rope is passed through a pulley fixed at the bottom of the second manhole by means of a brace temporarily set in the sewer. By means of this rope the cleaner is drawn through the sewer from one manhole to the next, by a windlass set above the second manhole. When the cleaner reaches the second manhole, the line holding the pulley to the brace in the sewer is slackened, allowing the cleaner and pulley both to be drawn to the surface. The cover is then removed

and the contents are dumped. The cleaner is of the double-end construction, so that it may be drawn back again to the first manhole without changing any ropes or pulleys. There are lugs on the bottom of the cleaner, which serve to keep it upright and allow it to pass over obstructions.

The apparatus requires only three men to operate, and at no time does a man enter the sewer during the operation of the cleaner. Practical tests of the machine show it to be capable of cleaning in one day 570 feet of 15-inch pipe at a depth of 23 feet below the street surface.

The apparatus entire, consisting of two windlasses, blocks and pulleys, 600 feet of wire rope, and cleaners for 8 to 10-inch pipe, 12 to 15-inch pipe, 18 to 24-inch pipe, and sewers over 2 feet in diameter, may be either leased or purchased from the Hayden Machinery and Supply Company, of 30 Church street, New York.

LOADINC STUDEBAKER DUMP WAGON WITH STEAM SHOVEL.

Loading a Dump Wagon with Steam Shovel.

One of the severest strains to which a dump wagon can be put is loading with a steam shovel. The illustration shows a loaded shovel in the act of discharging a full square yard of dirt into a Studebaker dump wagon from a height of fully 8 feet. The excavating is being done in Navarre Place, South Bend, Ind., by H. W. Reed & Sons.

A High-Pressure Street Flusher.

A new high-pressure street flusher has been put on the market by the Studebaker Bros. Manufacturing Co., South Bend, Ind., which has some points of decided advantage. It consists of a 750-gallon water tank on a truck platform gear, a gasoline engine underneath, driving a centrifugal pump and a distributing pipe between the wheels, equipped with adjustable nozzles, so that practically any desired angle of incidence of the water on the pavement can be secured.

Two great points are the constant pressure which is maintained by the pump and the ability to regulate this pressure at any point between 5 and 32 pounds, and keep it so until the tank is completely empty. Two of the principal objections to pressure flushing are thus eliminated, fluctuation in pressure and inability to regulate the pressure exactly according to the demands of the service. It is thus possible to clean a difficult street not in perfect repair with a minimum of damage from water pressure, and more safely than by any other effective method of cleaning. The company will send full information on request.

Imperial Waterproofing Keeps Out Water.

The success of Imperial waterproofing in keeping water out of underground structures under difficult circumstances is shown by the following letter, which was signed by the five members of the board of supervisors of Los Angeles county, California:

It gives us pleasure to make a statement concerning the efficiency of Imperial waterproofing.

When you offered to stop the flow of water coming into the court house elevator tunnel running from New High st. to the court house elevator, we looked upon your proposition as a huge joke, as the water was flowing like springs in a great many places all over the roof of the tunnel, but to-day there is not a particle of water flowing into the tunnel, or any indications of water whatever; besides, you have improved the appearance of our tunnel 100 per cent., and the small amount of expenditure we have made in applying the waterproofing is very much appreciated by the public.

Imperial waterproofing is certainly a

wonder, and if it is permanent, as you claim, it is certainly one of the most valuable commodities on the market.

Imperial waterproofing is put on the market by the A. F. George Co., 811 S. Spring st., Los Angeles, Cal., who will supply any desired information about it.

The Clark Meter Box.

The Clark meter box, manufactured by H. W. Clark & Co., of Mattoon, Ill., is designed to do away with the old practice of having the water meter situated within the house. It consists of a box of vitrified earthenware or concrete, set in the ground to such a depth as to be beneath the frost line. The meter, test cocks, fish traps and other accessories that should be open for inspection are contained within the box. A cast iron cover, with a removable lid, completes the box and furnishes a means of ready access to the interior. The meter is placed near the top of the box, so as to be easily inspected and so as to provide that warm air completely surround the instruments and prevents freezing.

The accompanying photograph shows the exhibit of the H. W. Clark Company at the convention of the American Water Works Association in New Orleans, where it was an object of much interest and drew the attention of many visitors.

The Troy Dump Box.

One of the standard dump boxes for use on ordinary teaming or farm wagon gears is the Troy, made by the Troy Wagon Works Co., Troy, Ohio. The box is of hard maple and the bottom is made of four leaves or doors of No. 10 gauge steel, bent at right angles along the outer edge and two are hung from the sides of the box, and the other two from a shield extending lengthwise through the center of the box, which protects the reach in the gear.

The doors are closed to place by chains at the ends which are wrapped round spiral grooves on the ends of a shaft attached to the outside of the box. This shaft is turned by a lever with ratchet at the driver's right hand.

The outer doors overlap the inner in closing, so as to make the bottom sand-tight, and the doors are thoroughly braced, ends and sides, with angle irons, so as to keep their shape under hard usage. These boxes have 1½ cubic yards capacity, or 2 yards with top box added.

The company also make the Troy bottom-dump wagons, gear and body in one, which are the most economical for continuous and heavy work. These wagons are made with capacity of 1½ to 5 cubic yards.

Catalogs will be sent on request.

Bitulithic Recommended for York, Pa.

A formal report giving the members the benefit of their observations, was presented at a recent meeting of the city council of York, Pa., by a party of councilmen who had visited Atlantic City, Wilmington and Baltimore to inspect paving. The councilmen reported that they had viewed many different kinds of paving and recommended the bitulithic. In the party were Councilmen Rose, Craumen, Bahne, Hake, Myers, Bentzel, Lish and Brenner.

The report follows:

The undersigned members of City Councils visited Atlantic City, Wilmington, Del., and Baltimore, Md., and made a careful and thorough examination of the street paving in those cities. We were given an opportunity to inspect all the different forms of pavement, bitulithic, brick, asphalt and wood blocks.

At Atlantic City, Tennessee avenue for one square is paved with wood block, and looked fine. We were, however, told by teamsters whom we questioned that it was very slippery in wet weather and that horses frequently fell on it. A gentleman whom we asked told us that this pavement cost $3.29 per square yard. We noticed some brick paving around the railroad station and in the alleys, some of which was good and some showed the result of wear and tear and was very rough and uneven.

Atlantic avenue, which is the main business street was paved with bitulithic,

a hundred feet wide and five miles long. and was n perfect condton. In addton This pavement is now in its fourth year and was in perfect condition. In addition to Atlantic avenue, there are twelve other streets paved with bitulithic. We rode or walked over these streets and we did not find a single hole or worn place. We were informed that the city has laid over 400,000 yards of this form of pavement, 50,000 yards of which were laid last fall, and we understand that the city expects to lay more of it this season. We talked with a number of city officials and other citizens, and all seem enthusiastic in their praise of the bitulithic pavement, preferrng it to any other form of paving.

We met the chief of the fire department, who made a run for us from two of the fire stations and we noticed that the horses, although smoothly shod, did not slip at all while running at top speed on the bitulithic pavement. The chief told us that the horses seemed to know the pavements, that they run with perfect freedom on the bitulithic, but would immediately slow down when they struck the brick or asphalt. In general, we noticed that the streets of Atlantic City were kept in splendid condition. It is the cleanest city we have ever seen.

From Atlantic City we went to Wilmington, Del., and drove over about three miles of streets. We found brick, asphalt and bitulithic. We saw on Market street, the main business street, one square of asphalt and one square of bitulithic immediately adjoining, which we were told the city laid five years ago as a comparative test. The bitulithic was, as far as we could see, in as good condition as were the bitulithic streets that were laid last year, but the asphalt was a mess, full of holes and worn places, though we were told that it had been repaired several times. The brick streets were in wretched condition, some of them almost impassable. The bitulithic paved streets were apparently as good as at Atlantic City, though a year older. There are about 300,000 yards of bitulithic pavement in Wilmington, but we did not see any asphalt except the one square above referred to.

From Wilmington we went to Baltimore, Md., and spent four hours driving and inspecting the streets. The first bitulithic in Baltimore was laid in the spring of 1906, Twenty-fourth street. It was in perfect condition. There are 75,000 yards of this pavement spread over thirty-seven streets. The amount laid in each year as given us by the superintendent who did the work is as follows: 1906, 34,546; 1907, 55,422; 1908, 97,322; 1909, 31,549 yards. If it were possible for any pavement to be better than we found in Atlantic City, it is here in Baltimore.

In conclusion this committee has to say that in our judgment the bitulithic pavement is far ahead of any form of pavement we have ever seen. It is smooth, without being slippery. There is a slight give to it, which makes it very easy on horses. It is clean, sanitary, quiet and best of all, it is durable. We earnestly recommend its construction to councils and citizens of York.

The Regulation of the Amount of Sulphur in Gas.

Only in four States of the Union and in the District of Columbia are there State regulations in regard to the amount of sulphur permissible in gas. In all of these, with the exception of Wisconsin, the limit is substantially 20 grains. In the latter State it has been increased to 30 grains. Massachusetts has had a struggle with the proposition to make a similar increase in the limit. At a legislative hearing, Mr. Arthur D. Little, chemical expert and engineer, of Boston, presented in brief the results of some most exhaustive experiments conducted to determine the influence of surphur in gas on the air in rooms. He showed that the present local restrictions are the outgrowth of ignorant legislation in England, where under the Gas Metropolis Act in 1860, Parliament limited the sulphur content of the gas supply in the city of London to 20 grains per 100 cubic feet.

The Massachusetts bill provided that "the Board of Gas and Electric Light Commissioners shall from time to time ascertain and prescribe what degree of purity may reasonably be required." At the hearing the Board recommended that the amount of sulphur allowed in illuminating gas be specifically increased from 20 to 30 grains. This recommendation was adopted at the hearing by the counsel for the Massachusetts Association of Gas Companies, who declared that the extra sulphur would help the companies operate cheaper, would prevent their violating the law against their will, and would injure no one. But the Board stated their decision to be that the question of purity is a question of such breadth of public fixed by the legislature before and has been satisfactory, and therefore see no reason why this policy should not be continued.

The evidence presented by Mr. Little and based upon his experiments showed that he had been unable to discover any possibility of injurious effects resulting from raising the limit to 30 grains. He presented a summary of the results of the careful investigation made in Wisconsin which led to a corresponding increase. It was shown that a lower sulphur restriction in gas would greatly limit the gas companies in the coal that they could use, and make it necessary for them to pay a much higher price for coals of lower sulphur content. The Wisconsin Commission was quoted as authority for the statement that they could not find that it had ever been well demonstrated that the difference of a few grains in the sulphur content of gas had any appreciable effect upon the air of rooms in which gas was burned, or effects that were otherwise harmful to health or property. It seemed to them that most of the gas restrictions were not founded upon inaccurate knowledge, but rather upon a blind following of the precedent set in other places. Mr. Little's experiments, which cover a period of some months, were conducted in a house set aside for the purpose, and include a study of the possible effect of gas under varied conditions. It was shown fundamentally that the sulphur gases formed in the combustion of illuminating gas are

removed from the air in three ways: By changing air in the ordinary course of ventilation; by condensation along with water vapors on the cold walls and closets, and through absorption by the alkaline constituents of the walls and ceilings. Mr. Little's experiments show that only within narrow limits does an increase in the sulphur content of the gas or of the rate at which the gas is burned cause a relative increase in the sulphur content of the room. In other words, that the disappearance of the sulphur gases increases with the concentration at which they exist in the air. Analysis of the plaster of the experimental room showed that there had been a natural increase in the amount of sulphur which it contained, but calculations showed that the plaster of a ceiling would serve to absorb sulphur gases from 20-grain gas burning 25 feet per day during the probable existence of a house. When the plaster was covered with paper the absorption was but moderately reduced.

The outside air was found to always contain considerable amounts of sulphur; at times from one-third to one-quarter as much as in the air of the room in which gas was being burned. It was impossible within the ordinary range of conditions to discover any odor to the sulphur in the gas. Samples of dyed goods were exposed in the room without discovery of any perceptible fading, and bright metals were in some cases tarnished more by the outside air than that within the room. The analysis of sulphur matches showed that they would liberate as much sulphur into the room as ordinarily would be liberated by 20-grain gas burning for 22 minutes. In connection with the hearing above referred to, Chairman Forrest E. Barker spoke as follows:

"In regard to the contention of the companies that they should not be fined if the excess of sulphur is due to an unavoidable cause or accident, I assume that, if the committee inserts such a clause in the bill it will do so only after it has become fully satisfied as to what such a clause means. I doubt if we know what such a clause would mean. I say what I do with respect to the construing of this clause after what has been said in favor of removing the restrictions on gas. I think that we have the impression that the companies think occasionally that sulphur will suddenly appear in gas from unavoidable cause, coming as a complete surprise to the company. If this is true, I wonder if it is fair to say that such a provision in the law might nullify any restrictions which were made.

"Now, in respect to the question of removing all restriction on the amount of sulphur which gas may contain, I want to explain the reference made by the Board to the removal of an obstruction to the reduction in the price of gas. The cost of purification per cubic foot is too small to affect greatly the selling price of gas, but any reduction in the cost of manufacture under proper regulation will eventually work to the advantage of the public either in making the price cheaper or in giving better service.

"I ought to state what you may expect if all restriction is removed. It has been said that about forty grains of sulphur in the gas would be all that would be found. That is not the opinion of the Board. We should expect to find the same amount here as is found in London. In some extreme cases ninety grains have been found. That is an extraordinary amount, but there have been a number of times when tests have shown that there were seventy grains present. It is said that the coal used in London contains more sulphur than that used here. If all restrictions are removed we should expect that the companies here would use coal with a great deal of sulphur in it."

Mr. Barker also stated that he did not believe that anyone knew whether a large amount of sulphur in gas was injurious. In investigating the matter the Board had had the assistance from the Harvard Medical School and the Institute of Technology, and the recommendations of the Board that the limit be placed at thirty grains was the result of the Board's inquiry. Until the presence of sulphur in gas is shown to be harmless, the Board will not recommend the removal of all restrictions.

Trade Publications.

Mr. G. R. G. Conway, chief engineer, has compiled a handsome booklet, describing the distributing reservoirs of the water works of Monterrey, Neuvo Leon, Mexico, and Obispado, in Mexico, on which the Pioneer water-proofing compound of the American Asphaltum and Rubber Company, of Chicago, was used.

The Barrett Manufacturing Company has issued a reprint of an article in the *New England Automobile Journal* describing the application of tarvia to the practical construction and preservation of highways.

"Yellow Pine Creosoted Blocks for Floor Coverings and Between Car Tracks" is the title of a pamphlet issued by the Yellow Pine Manufacturers' Association of St. Louis. They have also issued a booklet on the use of yellow pine creosoted blocks for streets, bridges and crossings.

The Mico reciprocating meter for counting piston travel is fully described in a catalogue issued by the Mechanical Instrument Company, of New York.

The Monthly Bulletin of the Universal Portland Cement Company has photographs and a description of the new machinery exhibition warehouse of the Pfannmueller Engineering Company, of Chicago.

The Pioneer Asphalt Company has issued an illustrated pamphlet on "Good Roads."

"Graphite" is the title of an address de-

livered before the Automobile Club of America, and which is reprinted and issued by the Co-operative Press of New York.

"Modern Incineration," issued by the Decarie Incinerator Company, describes the various plants installed by the company throughout the country. A number of half-tones illustrate the operation of the incinerator and the plants now in use.

The Stone & Webster Engineering Corporation, of Boston, have issued a booklet of work done and work doing for the second quarter of 1910.

The "Ready Drafting Instrument," a pocket combination compass, protractor, rule, scale, square and curve, is described in a leaflet from the Ready Manufacturing Company, of Rochester, N. Y.

"Standard Road Oil" is described by a booklet of that name issued by the Standard Oil Company.

Westrumite cold-laid asphalt pavement is described in a pamphlet issued by the Central Westrumite Company, of Chicago.

The *Edison Aggregate* for June contains a number of half-tones of bridges and dams built of Edison Portland cement.

The Portland sectional conduit is an underground pipe covering, designed to protect pipes from electrolysis and to furnish a perfect heat insulation. It is manufactured by the Portland Stoneware Company. A booklet issued by the company gives complete descriptions of the conduit and the method of handling it.

The Trussed Concrete Steel Company, identified with the Kahn system of reinforcement, has issued a catalogue of rib metal. The catalogue is illustrated by photographs and contains a full description of the use of rib metal. The main office is in Detroit, Mich.

Mr. H. E. Anschutz, C. E., of Montgomery, Ala., has published a map showing the location of all cotton mills in Alabama and Georgia. The map also shows the location of all water power in use or available, and the consumption of cotton per year by each mill.

The Smith patent rail clamp and division plates are devices to replace the old stake method of holding the rails for concrete sidewalk building. A booklet by S. C. Smith & Son, of Waverly, N. Y., describes the devices.

Circulars No. 251, 260, 261, 263 and 264, of the American Asphaltum and Rubber Company, of Chicago, are descriptive of the use of "Pioneer" asphalt in reservoir water-proofing. A booklet called "Pipe Coating Supremacy," by the same company, tells of the use of "Pioneer" mineral rubber pipe coating.

Circular No. 92 of the Office of Roads of the U. S. Department of Agriculture has an account of the progress made along the lines of experiments in dust prevention and road preservation. The experiments were carried on at Washington, D. C., Youngstown, O., and Ithaca, N. Y.

Trade Notes.

ASPHALT.

New York City.—The Eastern Asphalt Paving Co., general contractors, Manhattan, has been incorporated by Samuel J. Garger, Edward M. McInness and Sinclair C. Nussbaum, of New York City.

Spokane, Wash.—J. F. Hill has secured a lease on a site and is making preparations to establish a large paving plant.

Buffalo, N. Y.—The commissioner of public works has been directed to prepare plans and specifications and ask for bids for a municipal asphalt repair plant. Mayor Fuhrmann.

BRICK.

Oakland, Cal.—The Oakland Paving Brick Co., recently organized by E. A. Heron, H. W. Taylor, E. L. Dow, and others, has been begun preliminary work on the installation of its proposed plant at Decatur, Cal.

Hartford, Conn.— The Hartford Vitrified Brick Co. has recently taken over the plant of the Cambria Brick Co., at Bel Air, Md., and is making extensive improvements.

CEMENT.

"Atlas White" is the name of the new white Portland cement now marketed by the Atlas Portland Cement Company, New York. The company has sent out notices to the retail trade that it is ready to make shipments of this product, and guarantee it to be fully up to the high quality of the Atlas brands.

Du Bois, Pa.—Special.—The Du Bois Art Stone Works has a plant in this city, in which any and all kinds of cement products can be manufactured. Owing to the death of the owner and manager, the company has decided to lease it out for a term of years, and would like to communicate with prospective lesseses. Address C. S. Blomen, 515 Locust st.

Nazareth, Pa.—The Dexter Portland Cement Co. has obtained an option on a tract of white clay land near Saylesbury, and will manufacture White Portland cement.

Fairview, Okla.—The Fairview Cement Co. has been incorporated by M. E. and Henry Frame, John J. Nelson, Chas. H. Albert and J. W. Colvin, all of Alva, Okla., and John L. Perkins, of Carmen.

Sioux Falls, S. D.—The Dakota Portland Cement Co., whose headquarters are here, has let a contract for the construction of a plant near Chamberlain, S. D., to the Freeborn Engineering & Construction Co., of Kansas City, Mo.

PURCHASE OF MACHINERY.

Little Rock, Ark.—An ordinance has been passed authorizing the board of public affairs to purchase teams, wagons, and scrapers for the street department. Mayor Duley.

Topeka, Kas.—W. G. Tandy, cy. comr. of streets and public improvements, advocates a number of compressed air street sprinklers for this city.

Morrill, Neb.—Special.—H. A. Mark advises us that this city is in the market for first-class high grade transit with solar attachment. Also, for a plain stripped second-hand instrument in fair condition.

Oakland, Cal.—This city is in the market for a gyratory rock crusher.

MISCELLANEOUS.

New York City.—The C. W. Hunt Co., builders of coal handling, conveying and hoisting machinery, have opened offices

at the State Bank Bldg., Richmond, Va., and also at 607 Rhodes Bldg., Atlanta, Ga., with W. F. Lee in supervision.

New York City.—C. T. Anderson has been appointed manager of the Chicago office, 1616 Fisher Bldg., of the C. W. Hunt Co., builders of coal handling, conveying and hoisting machinery.

Branchland, W. Va.—The Branchland Bridge Co. has been incorporated to build and maintain toll bridges by L. R. Via, A. M. Parsons, L. W. Leete and Rufus Switzer, of Huntington, W. Va., and W. E. Beardsley, of Clarksburg, W. Va.

Considerable trouble was experienced by the street railway company of New Britain, Conn., when they endeavored to break holes in the Church street bitulithic pavement, for the purpose of welding their rail joints. The wearing surface of the pavement was so tough that it was only by means of hammers and wedges that the required openings could be made.

Patents Concerning Construction Molds and Forms.

878,639. Concrete Vault. Boyden Kinsey, Wyoming, O.

878,929. Stock Water Tank (cement). Edward Bergen, Glenbeulah, Wis.

881,678. Concrete Ash Pit. Jas. W. Graham, St. Louis, and Chas. A. Jones, Midland, Mo.

883,859. Framing Support for Concrete Construction. Thos. Corris, Cleveland, O.

884,733, 884,734. Molds for Concrete Walls. John Horsfield, Chicago, Ill.

874,167. Machine for Molding Units of Clay or Other Refractory Material to be Used in the Manufacture of Concrete. Wm. D. Crow, East Orange, N. J.

886,481. Cement Water Tank. John J. Daniel, Cambria, Wis.

890,466. Mold for Tapering Chimney Construction. Carl Stieler, Chicago, Ill.

891,883. Core for Concrete Structures. Joseph Vaughan, Ashland, Va.

892,543. Apparatus for Use in Construction of Concrete Buildings. Nicholas C. Newerf, Buffalo, N. Y.

893,471. Building Construction (molds for concrete). Chas. W. Fellgren, Chicago, Ill.

894,177. Mold for Cement Walls. Jesse W. Alexander, Birmingham, Ala.

896,223. Cement Burial Vault. Wm. H. Marshall, New Paris, O.

897,353. Wall for Buildings. John S. Culley, Louisville, Ky.

900,261. Machine for Forming Artificial Stone Walls. Jacob Brewer, Hazleton, Pa.

901,017. Concrete Building Wall Michael G. Mandt, Stoughton, Wis.

901,523. Mold for Making Burial Vaults. Thos. M. Cass, Ft. Worth, Tex.

902,050, 902,051. Safe and Fireproof Attachment for Vault. Thos. M. Brintnall, Oakland, and Nelson R. Doolittle, Berkeley, Cal.

902,204. Concrete Construction (building). Robert T. Brown, Boston, Mass.

902,311. Concrete Construction (building). Frederick Melber, Ross tp., Allegheny co., Pa.

903,996. Form for Concrete Construction. Chas. M. Markham, Chicago, Ill.

904,433. Concrete Form Holder and Adjuster. John G. Hosmer, Grand Junction, O.

905,416. Cement Burial Vault. Chas. A. Gibson, Indianapolis, Ind.

907,438. Form for Concrete Construction. Wm. L. Axium, Downers Grove, Ill.

907,496. Clamp for Mold Forms for Concrete Columns or Pillars. Wm. H. Healy, San Francisco, Cal.

907,878. Knockdown Form for the Construction of Concrete Bins. John H. Reeves, Orange, Cal.

908,305. Tomb or Burial Vault. Thos. J. Moore, New York, N. Y.

908,326. Apparatus for Building Concrete and Other Like Structures. Walter C. Polk, Ft. Branch, Ind.

910,064. Mold for Forming Burial Vaults. Alonzo O. Hunsaker, Kansas City, Mo.

910,515. Mold for Concrete Building Construction. Edgar J. Drayer, Dayton, O.

910,695. Mold (for concrete walls). Harry Lammon and John Mauska, Lebanon, S. D.

910,883. Mold for Concrete Walls. Wm. E. Turkington, Cherokee, Kan.

912,070. Framework for the Construction of Concrete Buildings. Wm. W. Carpenter, Tampa, Fla.

912,414. Burial Vault. Wm. C. Remmiller and Frank L. Campbell, Atlanta, Ill.

912,997. Burial Vault. Peter F. Dehr, Hinsdale, Ill.

913,090. Mold for Concrete Walls. Leon Barg, New York, N. Y.

913,441. Mold for Concrete Wall Construction. Gotthart Taubert, Pittsfield, Ill.

913,538. Apparatus for Use in Building Structures of Concrete or Other Plastic Material. David Morgan, Launceston, Tasmania, Australia.

914,417. Mold for Forming Burial Vaults. Alonzo O. Hunsaker, Kansas City, Mo.

914,590. Concrete Frame for Door and Window Openings. John H. and Daniel H. Maychel, Salt Lake City, Utah.

918,393. Burial Vault. Albert F. Farr, Franklin, Pa.

917,943. Burial Vault. Chas. K. Haw, Kansas City, Kan.

918,568. Band Tightener for Concrete Forms. Chas. M. Markham, Chicago, Ill.

919,687. Apparatus to be Employed in Building Walls of Concrete. Richard Bowen, Cheltenham, Eng.

921,820. Method of Constructing Buildings and Apparatus Therefor. Alexander Foster, Pasadena, and Edward W. Foster, Los Angeles, Cal.

925,080. Form for Concrete Construction. Jas. Can, Chicago, Ill.

925,204. Concrete Construction and Method of Producing the Same. G. A. M. Liljencrantz, Chicago, Ill.

925,912. Machine for Making Concrete Walls. Alexander J. Innes, Sutherland, Iowa.

926,269. One-Side Mold for Concrete Walls. John H. Magdiel, Salt Lake City, Utah.

926,674. Airtight (cement) Cistern. Bert L. Mills, Hastings, Neb.

927,806. Collapsible Cistern Mold. Dora Laughlin, Dayton, O.

928,392. Bond for Concrete Construction Forms. Chas. M. Markham, Chicago, Ill.

928,638. Mold for Concrete Burial Vaults. Milon J. Demorest, Belding, Mich.

929,470. Concrete Mold. Roy N. Neil, Cozod, Neb.

929,825. Cement Cistern Mold. Newman Bronhard, Toledo, O.

929,938. Mold (for concrete walls). John R. Haldeman, Springfield, Mo.

929,969. Permanent Concrete Form. Michael D. Murray, West Homestead, Pa.

930,102. Mold for Reinforced Concrete Walls. Geo. W. Stevens, Lynn, Mass.

932,092. Ornamental Molded Concrete Article. Geo. H. Bartlett, Boston, Mass.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Oconomowoc, Wis.—Council granted a petition for a sidewalk in West ave.

Jackson, Minn.—The construction of cement sidewalks is contemplated.

Creston, Ia.—A resolution has been introduced for paving Walnut st.

Joliet, Ill.—Brick paving is contemplated for Joliet st. J. R. Crown, mayor.

Caldwell, Idaho.—This city voted to issue $50,000 for paving purposes.

McKenzie, Tenn.—Surveys have been made for graveling the streets.

Brandon, Miss.—The construction of granolithic walks is contemplated.

Marinette, Wis.—A concrete pavement will be constructed here as an experiment.

Marshall, Minn.—The construction of sidewalks in Main st. is contemplated.

Baker City, Ore.—Resolutions have been passed for paving Bridge, Auburn and 2nd sts.

Roseburg, Ore.—The construction of 7 additional blocks of streets is contemplated.

Spring Valley, Minn.—The construction of sidewalks in various streets is contemplated.

East Peoria, Ill.—An ordinance has been passed by the village board for paving E. Wash st.

Elkhart, Ind.—Paving is contemplated for N. Main and Simon sts. A. M. Smith, cy. engr.

Walla Walla, Wash.—City council will ask for bids soon for paving 20 blocks of streets.

Lake Charles, La.—This city voted, July 14, to issue bonds for additional street paving.

Sault Ste. Marie, Mich.—Council has authorized the construction of a cement walk in Askum st.

Seattle, Wash.—Paving is contemplated for Beacon Hill by the Jefferson Park Impvt. Club.

Corvallis, Ore.—Council has decided to pave 4 additional streets, aggregating about 30 blocks.

Rich Hill, Wis.—Brick paving is contemplated for S. Washington and S. Walnut sts. Cy. clk. Metz.

Bellingham, Wash.—The city council has decided to readvertise for bids for paving Magnolia ave.

Snohomish, Wash.—Asphalt paving is contemplated from the Eagles' Hall to the Northern Pacific depot.

Williston, N. D.—Council is considering a petition to construct sidewalks in several streets.

Waukegan, Ill.—Mineral rubber asphalt paving is contemplated for Park ave. north of Washington st.

Tacoma, Wash.—Council has authorized the construction of cement walks around N. 35th and Cheyenne sts.

Dodge Center, Minn.—The construction of sidewalks is contemplated in several streets. Vil. coun.

Philadelphia, Pa. — Ordinances were passed July 14 for repaving Arch and Catharine sts. with wood blocks.

Bourbon, Ind.—Plans and specifications have been adopted for 5 blocks of paving in Main and Center sts.

East Grand Forks, Minn.—A petition has been presented to council asking for cross and sidewalks in De Mers ave.

Lansing, Mich.—The city engineer estimates the cost of paving Washington st. at $11,150, and Washtenaw ave. at $13,870.

Columbus, O.—An ordinance has been passed providing for paving in 3rd, Frankfort, Lazell and a number of other streets.

North Yakima, Wash.—City council has authorized the construction of 7 blocks of brick and 6 blocks of asphalt paving.

Browns Valley, Minn.—The village council has authorized the construction of sidewalks in several streets.

Sioux Falls, S. D.—Council has passed a resolution providing for the construction of cement curb and gutter.

Colorado, Tex.—This city voted to issue $30,000 bonds for improving about 9 sq. mis. within this city.

Monroe, Mich.—Bids will be asked, as soon as funds are available, for paving. T. E. White, cy. engr.; L. J. Humes, cy. clk.

Marshalltown, Ia.—The brick specifications are to be revised. Action will be taken in January preparatory to asking for bids for concrete paving.

Hastings, Neb.—The city engineer has been directed to prepare plans and specifications for brick paving in Lincoln ave., from 9th to 12th.

Visalia, Cal.—The property owners in W. Main, S. Church, Acequia, Garden, Locust, Center, Court and Oak sts. are in favor of asphalt paving.

Peoria, Ill.—Creosoted wood block paving is proposed now for Adams st. from Hamilton to Bridge sts. Perry ave. will be resurfaced with asphalt.

Pipestone, Minn.—Council will consider a resolution Aug. 8 for the construction of sidewalks.

Wichita, Kas.—Resolutions have been passed providing for Hassam paving in Morris st. and vitrified brick paving in an alley. Wm. Sence, cy. clk.

Oakland, Cal.—The park commissioners have directed the city engineer to prepare plans and specifications for sidewalks on the Lake Shore boulevard.

Meridian, Miss.—The bd. of supvrs. has voted to issue $200,000 bonds for constructing good roads. B. V. White, C. C. Dunn, T. C. Kinard, road comrs.

Swanville, Minn.—An ordinance has been passed for constructing sidewalks and crosswalks.

Dallas, Tex.—The property owners in Live Oak st. have petitioned for permanent paving.

Ft. Scott, Kas.—The construction of 20 blocks of brick paving is contemplated. Plans are being prepared for constructing a macadam road. Wm. McElroy, cy. engr.

Cedar Rapids, Ia.—Bids will be asked for soon for constructing 11,000 sq. yds. of vitrified brick paving in Grand ave. Mat. Miles, mayor; T. F. McCaulley, cy. engr.

Red Oak, Ia.—The improvement of streets, alleys and street intersections is contemplated.

Edmonds, Wash.—Special.—C. A. Messimer, cy. engr., advises us that plans and estimates have been filed for about 6,000 ft. of concrete walks and gutters in 3rd st.

Omaha, Neb.—Asphalt paving has been favorably decided upon for Dundee, the district lying between Dodge and Underwood sts., from 48th to 52nd sts. The board of trustees will let the contracts soon.

Baltimore, Md.—The residents along Evergreen Terrace are urging the bd. of est. to pave the roadway in front of Druid Hill Park, along Oren Place and Evergreen Terrace with asphalt.

Davenport, Ia.—A resolution has been passed providing for the construction of 1,018 sq. yds. of vitrified brick paving on concrete base, and 1,001 sq. yds. of concrete paving. Alfred C. Mueller, mayor.

Smithville, Tex.—At a recent meeting of the Ten Thousand Club, a good roads movement was inaugurated that, in connection with the work of the county commissioners, will insure first-class roads in the territory around this town.

Wethersfield, Ill.—The construction of cement sidewalks is contemplated in a number of streets. Vil. bd. trustees.

Hammond, Ind.—Objections will be heard Aug. 3 on proposed paving of an alley with vitrified brick. Adam R. Ebert, prest. B. P. W.

Moline, Ill.—Brick paving is contemplated for 3rd ave. and 15th st. Clark Anderson, cy. engr.

Dayton, O.—A resolution has been adopted to macadamize Covington pike.

Toledo, O.—A resolution has been approved for improving Central ave. from the Lake Shore tracks to Auburn ave., with tar macadam.

Texarkana, Ark.—Paving is contemplated for Pine st.

Tiffin, O.—A resolution has been adopted to pave W. Market st. with brick or Westrumite.

Barnesville, O.—A resolution has been passed to pave Church st. between Arch st. and N. Lincoln ave.

Troy, Pa.—An ordinance has been passed to pave W. Main st. and reconstruct Short st.

Columbus, O.—Ordinances have been passed for paving Reeb and Barthman aves. with vitrified brick or block. Geo. S. Marshall, mayor.

Buffalo, N. Y.—A resolution has been approved providing for the repair of all asphalt pavements out of guaranty and not beyond repair, until such time as the city shall have established a municipal asphalt repair plant. Resolutions have been approved for repaving Bryant st. and Woodlawn and West aves. with asphalt; Broadway with block Medina sandstone.

Knightsville, Ind.—The construction of many new cement sidewalks is contemplated.

CONTRACTS TO BE LET.

Cando, N. D.—Bids are asked until Aug. 15 for 80 rods of grade. Frank Shanley, co. audt.

Fayetteville, W. Va.—Bids are asked until Aug. 10 (readv.) for road work. Henry A. Gentry.

Leland, Wis.—Bids are asked until 12 m. Aug. 2 for constructing sidewalks. R. W. Garrison, mayor.

Peru, Ind.—Bids are asked until Aug. 3 for constructing 9 gravel roads. Chas. Griswold, co. audt.

Dallas, Tex.—Bids are asked until Aug. 11 for paving Scott st. road. John B. Ashe, co. audt.

Leland, Miss.—Bids are asked until Aug. 2 for constructing sidewalks. R. W. Garrison, mayor.

Vincentown, N. J.—Bids are asked until Aug. 4 for building a stone road. Wm. T. Joyce, clk. South twp.

Marion, Ind.—Bids are asked until Aug. 2 for building gravel roads. Andrew Y. Stout, co. audt.

Winamac, Ind.—Bids are asked until Aug. 2 for improving 5 public highways. Ellis S. Rees, co. audt.

Wabash, Ind.—Bids are asked until Aug. 2 for constructing gravel roads. J. P. Noftzger, co. audt.

Valparaiso, Ind.—Bids are asked until Aug. 8 for constructing gravel roads. Stephen B. Corboy, co. audt.

Washington, Ind.—Bids are asked until Aug. 6 for constructing a gravel road. Thos. Nugent, co. audt.

Vincennes, Ind.—Bids are asked until Aug. 2 for constructing a gravel road. John T. Scott, co. audt.

Mt. Gilead, O.—Bids are asked until Aug. 5 for constructing 1.75 mis. of road. Clifton Life, co. audt.

Bloomfield, Ind.—Bids are asked until Aug. 2 for constructing a macadam road. Peter M. Cooke, co. audt.

Crawfordsville, Ind.—Bids are asked until Aug. 2 for constructing a macadam road. Bennett B. Engle, co. audt.

Decatur, Ind.—Bids are asked until Aug. 4 for constructing a macadam road. H. S. Michaud, co. audt.

Tipton, Ind.—Bids are asked until Aug. 6 for constructing 5 stone roads. J. F. Barlow, co. audt.

Frankfort, Ind.—Bids are asked until Aug. 6 for constructing 15 gravel roads. F. Cromwell, co. audt.

Antigo, Wis.—Bids are asked until Aug. 6 for 4 blocks of macadam paving. G. O. Palmetar, cy. clk.

Loup City, Neb.—Bids are asked until Aug. 12 for constructing cement sidewalks. Peter Rowe, cy. clk.

Two Harbors, Minn.—Bids are asked until Aug. 15 for grubbing a county road. John P. Paulson, co. audt.

Olathe, Kas.—Bids are asked until Aug. 10 for building Kansas City-Olathe rock road, 18 mis. long. Bd. co. comrs.

Ft. Scott, Kas.—Bids are asked until Aug. 5 for building 22 mis. of Kansas City-Ft. Scott road. Cy. comrs.

Ft. Howard, Md.—Bids are asked until Aug. 15 for constructing macadam roads, concrete walks, etc. Constr. Q. M.

Martinsville, Ind.—Bids are asked until Aug. 2 for constructing gravel roads. B. E. Thornburg, co. audt.

Cincinnati, O.—Bids are asked until Aug. 12 for shaping up Reading Pike ready for oiling. Fred Dreihs, clk. co. comrs.

Bridgeton, N. J.—Bids are asked until 2 p. m. Aug. 2 for improving 5.39 mis. of Malaya road. W. M. Sharp, co. engr.

La Moure, N. D.—Bids are asked until Aug. 9 for constructing a cement sidewalk at the school house. F. P. Bennett, clk.

Huntington, W. Va.—Bids are asked until Aug. 11 for paving Maple ave., 26th st. and an alley with brick. John Coon, supt. sts.

Dayton, O.—Bids are asked until Aug. 4 for grading and macadamizing 2.64

mis. of Xenia Pike. Frank Munger, chm. co. comrs.

Binghamton, N. Y.—Bids are asked until Aug. 3 for paving Henry and Court sts. with brick. S. W. Murray, clk. bd. contr. and sup.

Pensacola, Fla.—Bids are asked until Aug. 19 for constructing 526,000 sq. ft. concrete sidewalks. L. Earle Thornton, cy. engr.

Canton, O.—Bids are asked until Aug. 5 for draining, grading and paving with brick, 2.54 mis. of road. J. H. McConnell, co. audt.

Decatur, Ala.—Bids are asked until Aug. 9 for macadamizing 10 mis. of county road. R. P. Boyd, co. engr., Box 173, New Decatur.

Gulfport, Miss.—Bids are asked until 8 p. m. Aug. 2 for constructing 13,000 sq. yds. of cement sidewalks. H. D. Shaw, cy. engr.

Pensacola, Fla.—Bids are asked until Aug. 10 for constructing 525,000 sq. ft. of concrete sidewalks. L. Earle Thornton, cy. engr.

Holland, Mich.—Bids are asked until Aug. 3 for 1200 sq. yds. of brick paving and 4600 ft. of curb and gutter. H. A. Naberhuis, cy. engr.

Sherman, Tex.—Bids are asked until Aug. 10 for constructing about 65 mis. of macadam roadway in road dist. No. 1. H. R. Wallace, co. audt.

Oakland, Cal.—Bids are asked until 2 p. m. Aug. 4 for constructing an asphalt roadway in Lakeside Park. Henry F. Vogt, secy. park com.

Columbus, O.—Sealed bids are asked until Aug. 4 for grading and macadamizing 3.71 mis. of road in Licking county. James C. Wonders, state highway comr.

East Chicago, Ind.—Bids are asked until Aug. 5 for improving 5 streets and constructing 20 mis. of cement sidewalk. C. K. Wallace, cy. engr.

Merchantville, N. J.—Bids are asked until Aug. 19 for constructing an Amiesite road .85 mi. long in Chapel ave. Bd. chosen freeholders, Camden.

Pittsburg, Pa.—Bids are asked until Aug. 3 for the permanent improvement of several public roads and highways. R. J. Cunningham, co. contr.

New Brunswick, N. J.—Bids are asked until Aug. 4 for grading cut-off of Donnell's Hill, N. Brunswick twp. P. H. S. Hendricks, dir. freeholders.

Cleveland, O.—Bids are asked until Aug. 10 for grading, draining and improving Broadview road No. 4. John F. Goldenbogen, clk. B. P. S.

Alexandria, La.—Bids are asked until Sept. 6 for paving Gould ave., from 11th to Levin st., with vitrified brick, and to city limits with gravel. Bd. ald.

Villisca, Ia.—Sealed bids are asked until Aug. 3 for paving and curbing 3rd ave., requiring 20,542 sq. yds. of paving and 7818 ft. of curbing. Geo. B. Sexton, cy. clk.

Naperville, Ill.—Bids will be asked about Oct. 1 for 61,850 sq. yds. of macadam bituminous filled pavement; 39,370 ft. cement curb; 16,000 cu. yds. grading; 13,000 ft. of drainage. W. S. Shields Co., engrs., Hartford Bldg., Chicago.

Frankfort, Ky.—Sealed bids are asked until 12 m. Aug. 2 for constructing brick and concrete walks, cut stone and storm water drainage at the new State Capitol Building. Edward M. Drane, secy. bd. state capitol comrs.

Ft. Riley, Kas.—Bids are asked until Aug. 11 for constructing 4500 cu. yds. grading; 6600 sq. yds. macadam road; 3900 lin. ft. concrete driveway curb; 6 concrete catchbasins; 500 lin. ft. 12-in. culvert pipe; 8000 sq. ft. concrete sidewalks; 950 sq. ft. concrete walk crossing road, concrete steps, etc. Capt. W. M. Whitman, constr. Q. M.

Davenport, Ia.—Bids are asked until Aug. 2 for paving an alley and Western ave. and Brown and Case sts. with vitrified brick. A. M. Compton, chm. B. P. W.

Akron, O.—Bids are asked until Aug. 11 for improving E. Market road. Chas. L. Wirth, clk. co. comrs.

St. Joseph, Mich.—Bids are asked until Aug. 3 for paving Broad st. with brick on sand foundation. Matthias Weber, cy. clk.

Logansport, Ind.—Bids are asked until Aug. 2 for paving 5th st. with brick. B. P. W.

Independence, Kas.—Bids are asked until Aug. 12 for macadamizing Rook road. Co. comrs.

Chicago, Ill.—Bids are asked until Aug. 2 for paving a large number of streets with vitrified brick, granite blocks, asphalt, etc. Albert Keeney, prest. bd. local impvts.

Oakland, Cal.—Bids are asked until Aug. 4 for constructing an asphalt roadway in Lakeside Park. Henry F. Vogt, secy. park comn.

Coeur d'Alene, Idaho.—Bids are asked until Aug. 8 for paving in districts Nos. 12 and 13.

Seattle, Wash.—Bids are asked until Aug. 5 for grading and regrading 12th ave. S., et al. B. P. W.

CONTRACTS AWARDED.

Alton, Ill.—V. Wolf was awarded a contract for paving Danford st. with vitrified brick.

Spokane, Wash.—P. J. McHugh was awarded a contract for paving Lakeview ave. for $32,649.

Buffalo, N. Y.—The contract for street repairs was awarded to the Barber Asphalt Paving Co.

Portland, Ore.—The Hassam Paving Co. was awarded a contract for paving Lombard st. for $127,545.

Carrollton, O.—A paving contract has been awarded Coss & Myers, of Wheeling, W. Va., for about $42,000.

Spokane, Wash.—The contract for paving Mission ave. was awarded to the Barber Asphalt Paving Co. for $84,500.

Wilmerding, Pa.—W. E. Howley was awarded a contract for macadamizing the old Monroeville road for $22,398.

London, Ont.—The contract for resurfacing Dundas st. was awarded to the Barber Asphalt Paving Co. for $12,716.

Boston, Mass.—The contract for constructing artificial stone sidewalks in the public streets was awarded to C. W. Dolloff & Co. and John Landis.

Buffalo, N. Y.—Special.—Henry P. Burgard was awarded a contract for paving Sycamore st. for $38,500. Robert Seibert was awarded a contract for constructing concrete sidewalks for 1 yr., at 7½ cts. a sq. ft.

Covington, Ind.—Haynes & Waymore, of this city, secured a contract, July 5, for constructing gravel roads.

Carmi, Ill.—The contract for paving was awarded to A. W. Eisenmayer of Granite City, Ill., for $60,000.

Sapulpa, Okla.—The contract for asphalt paving was awarded to the Peters Bros. Paving Co. for $40,000.

Helena, Mont.—Louis Johnson was awarded a contract for improvements in the 4th ward impvt. dist., for $74,121.40.

Paulding, O.—The coitract for macadamizing Auglaize pike was awarded to

the Lewisburg Stone Co., of Lewisburg, for $29,961.

Clarksburg, W. Va.—The contract for street paving was awarded to the Concrete Construction Co. for about $30,000.

Troy, N. Y.—McKenna & Walsh secured the contract for paving Douw st. with Mack brick at $2.29 a sq. yd. or $5,873.

Hot Springs, Ark.—The contract for paving Benton st. with blocks was awarded to the Zincoli Pole Co., of Texarkana.

New Britain, Conn.—Special.—The contract for 24,000 sq. yds. of bitulithic paving was awarded to Warren Bros. Co., of Boston.

Trenton, N. J.—Special.—A contract for 14,450 sq yds. of bitulithic paving was awarded to the United Paving Co., of Atlantic City.

Schenectady, N. Y.—The contract for paving Avenue A and Mason st. with asphalt was awarded to the Schenectady Contracting Co.

Tyrone, Pa.—The contract for brick paving on concrete base was awarded to the Central Construction Co., of Harrisburg, at $1.96½ a sq. yd.

Osceola, Ia.—Wm. Horrabin, of Iowa City, was awarded a contract for 13,000 sq. yds. of paving and 8,000 lin. ft. of cement curbing.

El Paso, Tex.—Special.—The Texas Bitulithic Co., of Dallas, was awarded a contract for 35,358 sq. yds. of bitulithic paving here.

Pottsville, Pa.—The contract for paving Centre st. with wood blocks was awarded to H. E. Vare, of Philadelphia, for $67,604.65.

Bloomington, Ill.—The Andrews Asphalt Co. was awarded a contract for resurfacing N. Main st. with asphalt, at $1.28 a sq. yd.

Wheeling, W. Va.—John B. Shannafelt was awarded a contract for 12,000 sq. yds. of paving and 1 mi. of curbing for $15,000.

Peoria, Ill.—Brewster & Evans were awarded contracts, July 18, as follows: Walnut st., brick, $5,001.80; Ellis st., $6,847.60.

Winston, N. C.—Special.—The contract for 4113 sq. yds. of bitulithic paving was awarded to the Atlantic Bitulithic Co., of Richmond, Va.

Greensburg, Pa.—The Hallam Construction Co., of Washington, Pa., was awarded a contract, July 12, for paving 9 sections of highways for $17,000.

Danville, Ind.—Contracts for constructing roads have been awarded as follows: John P. Shut road, L. R. Hiatt, $5200; Todd road, Walt G. Hadley, $4895.

Portland, Me.—The contract for constructing 5340 ft. of bituminous macadam road was awarded, July 15, to the Hassam Paving Co., of Worcester, Mass., for $8257.

Shawnee, Okla.—The contract for constructing 52,000 sq. yds. of paving was awarded to the Metropolitan Construction Co., at $1.99 a sq. yd.

Great Falls, Mont.—The contract for paving 10 blocks of the principal streets was awarded to Flinn & Hanlon, of Sioux City, Ia., for $80,000.

Vinton, Ia.—The contract for paving the entire business district with brick was awarded to Mike Ford, of Cedar Rapids, at $1.74½ a sq. yd.

Dallas, Tex.—The Municipal Paving Co. submitted the lowest bid, July 13, for as the lowest bid exceeded the special resurfacing the streets surrounding the county court house, for $12,862.50.

Atlantic City, N. J.—Special.—The contract for constructing 18,770 sq. yds. of bitulithic paving was awarded to the United Paving Co., of this city.

Vancouver, B. C.—Special.—The contract for 30,000 sq. yds. of bitulithic paving was awarded to the Warren Construction Co., of Portland, Ore.

Dallas, Tex.—Special.—The Texas Bitulithic Co. has been awarded 2 contracts for bitulithic paving comprising 9227 and 5905 sq. yds. respectively.

Berlin, Ont.—Special.—The Warren Bituminous Paving Co., of Toronto, Ont., was awarded a contract for 11,117 sq. yds. of bitulithic paving.

Wilmington, Del. — Special. — Warren Bros. Co., of Boston, secured a contract for 30,000 sq. yds. of bitulithic paving in this city.

Chicago, Ill.—The Citizens' Construction Co. was awarded contracts, July 8, for creosoted block paving in Adams, Congress, La Salle and Monroe sts., for $65,000.

Richmond, Ind.—John F. Cronin & Co. secured a contract, July 11, for constructing a gravel road, with asphaltic cement dressing, for about $54,500.

Indianapolis, Ind.—The contract for paving Daly st. from Cruse to Pine, with brick, was awarded, July 11, to the American Construction Co., at $3.25 a lin. ft.

Chehalis, Wash.—The Warren Construction Co. was awarded a contract for 25,763 sq. yds. of paving in Pacific and Chehalis aves. and Market st., for $91,100.

Columbus, O.—Sidewalk contracts at the Columbus Barracks have been awarded as follows: Cement sidewalks, Acme Paving Co.; brick sidewalks, 5212 sq. yds., D. E. Sullivan.

Avalon, Pa.—The contract for grading, paving and curbing Chestnut st. was awarded to Michael O'Herron for $5,317.20, and for Locust st., to Ott Bros., for $6215.10.

Sheridan, Wyo.—The contract for paving Main and other streets with creosoted wood blocks was awarded, July 20, to Jas. Kennedy, of Fargo, N. D., for about $310,000.

Redding, Cal.—Contracts have been awarded as follows: Completing w. s. of road from Kennett to Antler, division 1, Chris. Stabler, $10,929; division 3, Matt Wengler, $11,250.

Great Falls, Mont.—The contract for constructing 10 blocks of creosoted wood block paving in the down town district was awarded to the Kettle River Company, of Minneapolis, for $69,989.76.

Princeton, Ind.—The contract for improving Broadway and Haier sts. under the township road law was awarded to W. Ewing Sheilds, of Seymour, for $17,286.24 and $24,574.82 respectively.

Ft. Dodge, Ia.—The contract for constructing 17 blocks of concrete paving was awarded to the North Star Concrete Co., of Mankato, Minn., and the St. James Tile Mfg. Co., for about $52,000.

Norfolk, Va.—The contract for paving and curbing 12th st. between Williams ave. and the cemetery gate was awarded to P. J. Looney, at 38 cts. a sq. yd. and 8 cts. a ft. for curbing.

Portland, Ore.—Special.—Contracts for bitulithic paving have been awarded as follows: Warren Construction Co., Portland, 30,043 sq. yds.; Pacific Bridge Co., Portland, 8928 sq. yds.

Canton, Ill.—The contract for constructing a road in dist. No. 5 was awarded to M. Heckard & Son, of this city, as follows: Excavating, 46 cts.; brick, $1.58 a sq. yd.; curbing, 21 cts. a lin. ft.; total, $32,825.08. Roller & Saville, city secured

the contract for constructing a road in dist. No. 6, as follows: Excavating, 46 cts.; brick, $1.59; curbing, 21 cts.; total, $67,630.85.

Memphis, Tenn.—The contract for resurfacing all of the old brick pavements in the down town business district with natural lake asphalt was awarded to the Memphis Asphalt & Paving Co., for $34,000.

Tacoma, Wash.—The Keasel & McDowell Logging Co. was awarded a contract for paving Commerce st. with stone blocks, for $15,000. Joseph Warter & Co. secured the contract for asphalt paving in an alley.

Buffalo, N. Y.—Robert Seibert was awarded the contract, July 14, for constructing and repairing concrete sidewalks at 7½ cts. a sq. ft. The German Rock Co. secured the contract for paving Carroll st. for $9220.

New Orleans, La.—The Barber Asphalt Paving Co. was awarded contracts, July 11, as follows: Repaving Burdette st. with asphalt, $12,995; paving Bienville st., $12,781.90; Alexander st., asphalt, $36,227.

Superior, Wis.—The contract for paving Banks ave. with crushed rock on top of the cedar block pavement was awarded to Peterson & Holm for $10,797.15; Lund & Co. secured a contract for constructing 2 mis. of cement sidewalks.

Erie, Pa.—Paving contracts were awarded, June 27, as follows: 7th st., Mayer Bros., Class B asphalt, $1 a sq. yd.; concrete base, 46 cts.; E. 3rd st., McCormick & Son, Bessemer block, $1.52 a sq. yd.; 14th st., F. J. Eichenlaub, brick, $1.05.

Chattanooga, Tenn.—The West Construction Co. was awarded the contract, June 28, for paving Chestnut st. with asphalt and Wyatt st. with asphalt macaadam. The Noll Construction Co. was awarded a contract for paving Main and 9th st. with brick.

Pasadena, Cal.—The contract for curbing, guttering and oil macadam paving in Villa st. was awarded to the John R. Ott Construction Co. for $24,650, and Lake ave. for $14,350. Andrew Holloway was awarded the contract for oil macadam in Center st. for $12,300.

Trinidad, Colo.—John A. Laughlin was awarded a contract for paving Animas st. and Grant ave. with asphalt macadam, at $1.25½ a sq. yd.; concrete curb, 70 cts. a lin. ft.; concrete gutter, 40 cts.; oak headers, 40 cts.; draining, including outlet, $11,097; total, $24,000.

Pekin, Ill.—Jansen & Zoller, of this city, secured the contract, July 11, for paving Park ave. with mineral rubber for $4,587. The contract for paving 3rd st. and 3rd st. place with brick with asphalt filler was awarded to the Illinois Cement Construction Co., of Springfield, for $4,500.

Indianapolis, Ind. — Contracts were awarded, July 7, as follows: Sherman drive, asphalt, Marion County Construction Co., $3 a lin. ft. each side; cement walks, Washington st. from Jefferson to Beville, Wm. H. Hall, 15½ cts. a sq. ft.; Ruckle st., Lackey Bros., 13 cts.; Denny st., Henry Polthast, 15 cts.; Addison st., M. Saperie, 14 cts.; Grace st., J. D. Hoss, 15 cts.

Waukesha, Wis.—Special. — The Advance Construction Co., of this city, was awarded a contract, July 11, for 31,000 sq. yds. of tar macadam and 5770 sq. yds. of brick paving, for $51,347.28. The other bids submitted were as follows: Marquette Construction Co., of Chicago, $52,347.28; A. J. Hewitt, Milwaukee, $53,-305.64; J. Stanchfield, Fond du Lac, $54,-219.09; Miracle Construction Co., Minneapolis, $7,010.24.

Detroit, Mich.—Paving contracts were awarded, June 29, as follows: Shipherd ave., brick, T. E. Currie, $1,263.43; alley 185, James Hanley, $985.61; alley 186, James Hanley, $1,373.60; alley 187, T. E. Currie, $2,013.69; alley 188, R. T. Baker Co., $1,672.66; alley 189, R. T. Baker Co., $3,606.22; Butternut street, cedar, Ferdinand Porath & Sons, $5,916.49; Hudson ave., cedar, J. Porath, $2,338.58; Waterloo st., cedar, H. W. W. Hatch & Sons, $2,072.94; McGraw ave., concrete, J. Porath, $6,048.04; 23rd st., concrete, J. Porath, $6,750.32.

Hartford, Conn.—Contracts for constructing state road work were awarded, July 11, as follows:

Town of Plainville, 7298 lin. ft. macadam-telford, including one 15-in. tile pipe culvert, 14-ft. roadway, to O. T. Benedict, Pittsfield, Mass., at $8,685 for macadam and 79 cts. per lin. ft. extra for telford, and 75 cts. for rubble drain.

Town of Farmington, 9,104 lin. ft. macadam-telford, including one 12-in., two 15-in. and two 18-in. tile culverts and a reinforced concrete arch culvert, 14-ft. roadway, to O. T. Benedict, Pittsfield, Mass., at $14,475 for macadam and 60 cts. per lin. ft. extra for telford and 75 cts. for rubble drain.

Town of Warren, 1900 lin. ft. graded telford road, including two 15-in. and one 24-in. tile pipe culverts, 14-ft. roadway, to Goodman & Trumbull, Litchfield, Conn., at $2622 for grading, 90 cts. per lin. ft. extra for telford and rubble drain.

Town of Bolton, 3640 lin. ft. graded telford road, including one 12-in. tile culvert, 14-ft. roadway, to Goodman & Trumbull, Litchfield, at $4280 for grading and 90 cts. per lin. ft. extra for telford and rubble drain; 60 cts. per sq. yd. for cobble gutters.

Town of Avon, 7700 lin. ft. macadam-telford road, including five 24-in., four 18-in. and one 15-in. tile culverts and one reinforced concrete arch culvert, 14-ft. roadway, to Peter Suzio, Hartford, at $30,000 for macadam, $2.40 per lin. ft. for telford, $1.65 for rubble drain, 60 cts. per sq. yd. for cobble gutters.

Town of West Hartford, 9885 lin. ft. macadam-telford road, including one 20-in., five 18-in., two 15-in., and three 12-in. tile culverts, 14-ft. roadway, to Peter Suzio & Co., Hartford, at $38,551 for macadam, $2.40 for telford, $1.65 for rubble drain, 60 cts. per sq. yd. for cobble gutters.

Town of Mansfield, first section, 1600 lin. ft. gravel-telford road, 16-ft. roadway, to H. L. M. Ladd, New London, at $2900 for grading and 60 cts. per lin. ft. for telford; second section, 2500 lin. ft. graded telford road, including two 20-in. tile culverts, 16-ft. roadway, to Clayton & Curtiss, Glastonbury, Conn., at $6875 for grading, 75 cts. per lin. ft. for telford. All bids for the third section, 13,941 lin. ft. on the Storrs Colle road, were rejected, appropriation made for this work.

Town of Winchester, 10,750 lin. ft. macadam-telford road, including ten 15-in., five 18-in., five 20-in., and three 24-in. tile culverts, 14-ft. roadway, to John De Michiel & Bro., Torrington, Conn., at $3.36 per lin. ft. for macadam, $3.80 per lin. ft. for telford, $1 for rubble drain and $5 per cu. yd. for masonry walls.

SEWERS.

CONTEMPLATED WORK.

Alturas, Cal.—A sewerage system is contemplated.

Willmar, Minn.—Bonds will be issued for constructing sewers.

Pasco, Wash.—A new sewerage system is contemplated.

Springfield, Minn.—A sewer in Van Buren st. is proposed.

Dubuque, Ia.—A sanitary sewer in Grandview ave. and Dodge st. is contemplated.

Wolsey, S. D.—The question of a modern sewerage system is being urged.

Albany, Ore.—The extension of the sewerage system is contemplated.

Yukon, Okla.—Voted to issue bonds to construct a sewerage system.

Pullman, Cal.—Surveys will be made for constructing a sewer system.

Sigourney, Ia.—Plans will be prepared for installing a sewerage system.

Chambersburg, Pa.—The installation of a sewerage system is being urged.

Klamath Falls, Ore.—The city council voted to issue $5,000 sewer bonds.

Sandusky, Mich.—The installation of a sewerage system is contemplated.

Mankato, Minn.—Council has decided to rebuild the Vine st. sewer.

Willow Lakes, S. D.—The construction of a sewerage system is contemplated.

Erwin, Tenn.—Voted to issue bonds for sewer construction and street improvements.

Arlington Heights, Ill.—Plans will be prepared for a septic tank and sewer system.

Yorkville, N. Y.—Plans and specifications have been prepared for a sewerage system.

Provo, Utah.—An ordinance has been passed to construct a sewer in district No. 11.

Kennewick, Wash.—Plans have been prepared for a sewerage system to cost $85,000. Engr. Hanford.

Heron, S. D.—Council has been presented with a petition asking for a sewer \n Wisconsin st.

Vancouver, B. C.—Will vote Aug. 20 on the question of issuing $40,000 bonds for sewer construction.

Bloomfield, Ind.—The construction of a sewer in Mechanic st. is contemplated. Bd. trustees.

Ellensburg, Wash.—Plans have been completed for an extensive sewer system. G. N. Miller, cy. engr.

Marinette, Wis.—Council proposes to enlarge the 15-in. sewer from Ella court to the Menominee river.

Glasgow, Mont.—Special.—E. S. Severance desires to purchase automatic syphon for sewer flush tanks.

East Grand Forks, Minn.—Plans and specifications have been prepared for constructing a sewerage system.

Sioux Falls, S. D.—Plans have been adopted by the board of county commissioners for the proposed west side sewer district.

Twin Falls, Idaho.—Bids will be asked about September for constructing pipe sewers. Stuart H. Taylor, cy. clk.

Anamosa, Ia.—A resolution has been passed for constructing a sanitary sewer in Gamarillo st. Robert Johnson, mayor.

Spencer, Ia.—A resolution will come up for passage and adoption, Aug. 19, for constructing a sewer. R. L. Taylor, cy. clk.

Council Bluffs, Ia.—A resolution has been passed providing for the construction and reconstruction of sewers in certain streets and avenues. Thos. Maloney, mayor.

Akron, O.—A bond issue is proposed for the construction of a main trunk sewer in Euclid, Ira and Cole aves. W. T. Sawyer, mayor.

Ft. Madison, Ia.—Action will be taken Aug. 1 on the proposed construction of a sanitary sewer in several streets.

Norman, Okla.—Special.—J. W. Klingensmith requests the price of automatic sewage lifting station equipment.

Owatonna, Minn.—A petition has been submitted to council asking for the construction of a new sewer system.

Lansing, Mich.—The city engineer has been directed to prepare plans for a sewer in Franklin ave. and Clark st.

Vancouver, B. C.—The city engineer has submitted plans for constructing a sewerage system in the southeastern part of town.

Brinkley, Ark.—This city will construct 8 mis. of sewers this summer.

Ellisville, Miss.—The installation of a sewerage system is contemplated.

Madison, S. D.—Plans will be prepared for constructing a sewerage system.

Princeton, Ill.—The construction of 2 new sewerage districts is contemplated.

Antigo, Wis.—Plans have been submitted to council for a septic tank for sewage disposal.

Duluth, Minn.—The Woodland trunk sewer will be constructed at an estimated cost of $138,352.

Masontown, Pa.—This city voted to issue $25,000 bonds for the construction of a sewerage system.

Bay City, Tex.—The question of organizing drainage district No. 2 of Matagorda county will be voted on.

Lake Charles, La.—This city voted to issue bonds for the construction of a complete sewerage system.

West Salem, Wis.—The village council will take action Aug. 2 on the construction of a sewerage system.

Marion, Ind.—Plans and specifications will be prepared for building a sewer between Washington and Branson sts.

Pocatello, Idaho.—Special.—W. A. Samms, cy. engr., says this city voted to construct trunk line sewers.

Terre Haute, Ind.—An ordinance has been passed providing for the issue of bonds for constructing sewers.

Wilmar, Minn.—The city council has again voted to issue bonds for the construction of a sewerage system.

Pontiac, Mich.—Objection will be heard Aug. 8 on the proposed construction of certain lateral sewers. Jos. H. Thorpe, cy. clk.

Columbus, Ind.—A petition is being circulated asking for the construction of a sewer in 16th st. from Washington st. to Home ave.

St. Joseph, Mo.—City engineer Lawler has been directed to inspect the Blacksnake sewer from its mouth to Middleton st. with a view to its improvement.

Hazleton, Pa.—In compliance with the demand of the State health department, this city will be required to construct a sewer system and sewage disposal plant.

Kansas City, Kas.—Ordinances have been passed for constructing a sewer in sub-sewer district No. 8 in sewer district No. 1 (Argentine). J. E. Porter, mayor.

Mobile, Ala.—Preliminary surveys are being made for the establishment of a perfect sewer and sanitary arrangement in all of the suburbs adjoining this city.

Evansville, Ind.—A resolution has been adopted providing for the construction of a main sewer in Maryland st. and Hess

ave. Simon A. Bartholome, clk. B. P. W.

Flint, Mich.—Plans have been prepared for the construction of sanitary sewers in Baker and Taylor sts. and a storm water sewer in Industrial ave.

New York City.—Plans have been authorized by the board of estimate and apportionment for constructing a system of sewer mains for the benefit of the Richmond Hill and Ridgewood Heights sections.

Fulton, N. Y.—Plans and specifications for a partial reconstruction of the 15-in. vitrified pipe sewer alongside the 36-in. drain now being built by the State at Upper Landing have been completed.

East Moline, Ill.—H. G. Paddock, cy. engr., has been directed to prepare estimates of the cost of extending sewer service into new territory south of the Rock Island and Burlington tracks between 10th and 13th sts.

Modesto, Cal.—Plans and specifications have been submitted by Geo. H. Freitas, cy. engr., and Robert H. Goodwin, cons. engr., for the proposed new sewerage system. The board of trustees will call an election to vote on a $70,000 bond issue.

CONTRACTS TO BE LET.

Logansport, Ind.—Bids are asked until Aug. 2 for constructing a sewer in Miles st. B. P. W.

Battle Creek, Ia.—Bids are asked until Aug. 16 for constructing a sewerage system. E. E. Carlson, engr.

New Castle, Ind.—Bids are asked until Aug. 13 for constructing a drain. Chas. E. Byrkett, drainage comr.

Hammond, Ind.—Bids are asked until Aug. 3 for constructing a vitrified pipe sewer. Adam R. Ebert, chm. B. P. W.

Harlan, Ia.—Bids are asked until Aug. 10 for constructing 5½ mis. of drainage ditch. Albert Hansen, co. audt.

Winnemucca, Nev.—Bids are asked until Aug. 2 for constructing a sewerage system. C. W. McDied, clk. bd. co. comrs.

Horton, Kas.—Bids are asked until 8 p. m. Aug. 2 for constructing a main sewer and purification plant. B. B. Norris, cy. clk.

Hawarden, Ia.—Bids are asked until Aug. 3 for constructing 1500 ft. 8-in., 800 ft. 10-in., and 2600 ft. 12-in. sewer. T. J. Reeves, clk.

Pasadena, Cal.—Bids are asked until Aug. 9 for constructing a sewer system, laterals, flushtanks and manholes. W. L. Brown, cy. engr.

Binghamton, N. Y.—Bids are asked until 4 p. m. Aug. 3 for constructing a sewer in Alice st. S. W. Murray, clk. bd. contr. and sup.

Cleveland Heights, O.—Bids are asked until Aug. 9 for constructing sewers, water mains, etc. H. H. Canfield, vil. clk.

Huntington, W. Va.—Bids are asked until Aug. 11 for constructing sewers in 2 streets and 3 avenues. A. P. Maupen, cy. engr.

Ventnor City, N. J.—Bids are asked until 8 p. m. Aug. 3 for constructing sewage disposal works. W. I. Risley, cy. engr.

Hoquiam, Wash.—Bids are asked until Aug. 3 for constructing sewers, gravel roads, etc., on 9th, 10th, 8th and M sts. Cy. clk.

Ft. Crocket (Galveston), Tex.—Bids are asked until Aug. 22 for constructing a sanitary sewer system and sewage pumping plant. P. Whitworth, Capt. Q. M.

Washington, D. C.—Bids are asked until Aug. 3 for furnishing sewer and water pipe to be delivered at Leavenworth, Kas. R. V. LeDow, supt. prisons, Washington, D. C.

St. Petersburg, Fla.—Bids are asked until Aug. 11 for constructing 1800 ft. 16-in. c. i. flange outlet sewer pipe in Tampa Bay. M. W. Spencer, cy. engr.; W. F. Divine, cy. clk.

Laporte, Ind.—Bids are asked until Aug. 8 for constructing 7300 ft. 10-in., 1600 ft. 12-in., 1400 ft. 15-in., 944 ft. 18-in., and 1307 ft. 24-in. sewers. Ezra E. Shoecraft, cy. engr.; F. F. Kmeyer, cy. clk.

Grand Forks, N. D.—Sealed bids are asked until 4 p. m. Aug. 4 for constructing an 8-in. sewer from the proposed public comfort station in Riverside park. W. V. O'Connor, clk. park bd.

Madison, N. J.—Bids are asked until 8 p. m. Aug. 8 for constructing 12 mis. of sewers, with manholes, flushtanks and other appurtenances. Hering & Fuller, engrs., 170 Broadway, New York City.

Woonsocket, R. I.—Bids are asked until 2 p. m. Aug. 4 for constructing 3600 ft. 8-in. sanitary sewer and appurtenances and about 660 ft. of surface water drain, part pipe and part concrete. Frank H. Mills, cy. engr.

Beaumont, Tex.—Bids are asked until Aug. 2 for constructing 100 lin. ft. 27-in., 1140 ft. 24-in., 1080 ft. 18-in., 5445 ft. 15-in. pipe sewer and 1600 ft. 3.5x3-in. concrete sewer, 1500 ft. brick or concrete sewers. C. L. Scherer, cy. engr.

CONTRACTS AWARDED.

Marion, Ind.—F. M. Benner was awarded a contract for constructing a sewer in 18th st., for $8,430.

Pella, Ia.—W. D. Yeager, of Cedar Rapids, was awarded a contract for constructing sewers, for $7,957.

Bridgewater, S. D.—William Welsh was awarded a contract for constructing a complete sewerage system.

Watertown, N. Y.—Hayes & Hodge secured the contract for constructing the new 1st ward trunk sewer, for $18,836.

Huron, S. D.—The Brookings Construction Co. was awarded a contract, July 5, for constructing lateral sewers, for $7,697.50.

Memphis, Tenn.—T. A. Garvin was awarded a contract for constructing sewers in the Olive st. district, for $11,468.75.

Hutchinson, Kans.—The contract for installing 4 sewers was awarded, July 5, to Davis &, Everett, of this city, for $5,593.21.

Jackson, O.—The contract for building a large sewer was awarded to Elmer E. McConnell, of Kenton, O., for $14,000.

Xenia, O.—The contract for constructing a sewer was awarded to Huonker & Williams, of Springfield, O., for $12,000.

Glencoe, Ill.—Frank R. Mortimer, of this city, was awarded a contract for constructing the South End sewer system, for $41,620.

Pasadena, Cal.—Andrew Holloway was awarded a contract for constructing a septic tank at the municipal sewer farm, for $16,250.

Waukon, Ia.—The contract for constructing a sewerage system was awarded to the Thill-Manning-Whalen Co., of La Crosse, Wis.

Vale, Ore.—The American Light and Water Co., of Kansas City, Mo., was awarded the contract for constructing sewer and water systems.

Phillipsburg, N. J.—Michael O'Hagen was awarded the contract, July 12, for constructing a coscrete surface water sewer in Meadow ave., for $7,000.

Waukegan, Ill.—Sewer contracts were awarded July 1 as follows: Washington st., $4,155.35, and Glen Rock ave., $2,-

234.40, H. C. Patterson; Walter, Jumper and St. James sts., Wm. Davidson, $2,592.25.

Millburn, N. J.—The contract for constructing 9,300 ft. of sewers was awarded, July 18, to Pasquale Maurillo, of Orange, for $7,121.50.

Norwalk, O.—The contract for constructing the joint Huron-Crawford-Richland county ditch was awarded to Gilman Bros., July 9, for $27,000.

O'Neil, Neb.—The contract for constructing a sanitary sewerage system was awarded to Donahue & Peterson, of 15 N. 30th st., Omaha, for $16,507.

Anderson, Ind.—The contract for constructing a cement tile ditch several miles long was awarded to the S. T. Sheets Construction Co., of Paris, Ill., for $17,000.

Burlington, Okla.—The contract for constructing a sanitary sewer system was awarded to the Tonkawa Construction Co., of Tonkawa, Okla., for $33,112.

Missoula, Mont.—The contract for constructing a sewer was awarded, July 14, to Jas. Kennedy, of Fargo, N. D., for $199,000.

Seattle, Wash.—C. J. Erickson was awarded a contract for constructing the Lake Washington division of the North trunk sewer for $720,000.

San Francisco, Cal.—The Metropolis Construction Co., of this city, was awarded a contract for building sewers in 4th and Kentucky sts., for $33,182.

Findlay, O.—The Hancock Stone Co., of this city, was awarded a contract for constructing 5 mis. of storm pipe sewers in Delaware twp. for $16,890.

New York City—O'Leary & Flanagan, 245 E. 202nd st., secured the contarct, July 6, for constructing sewers in Northern ave., for $41,248.

Edwardsville, Ill.—O. T. Dunlap has been awarded a contract for constructing the central outlet sewer along the Steam Mill Branch, at 68½ cts. a ft.

Sandpoint, Idaho.—A. Burns, of Spokane, Wash., was awarded a contract for constructing section No. 1 of district No. 1, of the sewerage system, for $37,597.

Moline, Ill.—The contract for constructing a drainage ditch in Hampton dist. No. 4 was awarded, July 8, to Mathews Bros. & Co., of Erie, for about $15,000.

Elkhart, Ind.—The Northwestern Construction Co. submitted the lowest bids, July 20, for sewer construction, as follows: Elkhart ave., 16,823.60; Kilbourn st., $1,398.10.

Dubuque, Ia.—The contract for constructing a concrete storm sewer, known as the Bee Branch sewer, was awarded, July 7, to the O'Farrell Contracting Co., 79 Clark st.

Boston, Mass.—Sewer contracts have been awarded as follows: Friend st., E. F. Kennedy, Journal bldg., Boston, $3,760; Dartmouth st., Peter W. Hill, Old South bldg., Boston, $19,477.

Norristown, O.—The contract for constructing a sewage disposal and cast iron pipe lines at the State Hospital for the Insane was awarded to the Pitt Construction Co., 821 Fulton Bldg., Pittsburg, for $39,629.

Des Moines, Ia.—T. J. Casselberry was awarded a contract for constructing the E. 10th st. sewer system, at $2 a lin. ft. The Cook Construction Co. secured the contract for the 23rd st. sewer system, at $1.84 .a lin. ft.

Indianapolis, Ind.—Sewer contracts were awarded, July 11, as follows: Alley north of 35th st., from Clifton ave. to Barnes ave., Manley-O'Donnell Co., 1,000; alley east of Sherman Drive, American Construction Co., $1,850.

Sabetha, Kans.—Contracts were awarded, July 12, as follows: Sanitary sewers, P. A. Johnson & Co., 437 N. 10th st., S. Kansas City, Kans., $19,206; 2 separate sewage disposal plants, Lewis & Kitchen, 901 Broadway, Kansas City, Mo., $12,500.

St. Louis, Mo.—The George G. Prendergast Construction Co., of this city, was awarded a contract for constructing the first section of the Glaise Creek joint district sewer, as follows: 76,100 cu. yds. excavation, 93 cts.; 7,000 cu. yds. Class A concrete, $7.80; 500 cu. yds. Class C concrete, $7.15; 990 cu. yds. brick masonry, $9; 970 cu. yds. vitrified brick masonry, $9; 430 lin. ft. 6 to 3-in. pipe sewer, 40 cts. to $4; 76,800 lin. ft. ⅜ sq. in. steel bars, 1½ cts.; 178,700 lin. ft. ½ sq. in. steel bars, 2 cts.; 93,300 lin ft. ⅝ sq. in. steel bars, 3¼ cts.; 45,000 lin. ft. ¾ sq. in. steel bars, 4½ cts.; 53,800 lin. ft. ⅞ sq. in. steel bars, 6 cts.; 17,700 lin. ft. 1 sq. in. steel bars, 8 cts.; 164 pieces 6 in. junction slants, $1; 5,400 lbs. cast iron, 3 cts.; 1,250 lbs. wrought iron, 5 cts. Total, $161,616.

WATER WORKS.

CONTEMPLATED WORK.

Ocheyedan, Ia.—A water works system is proposed.

Butler, Wis.—A water works system is contemplated.

Eveleth, Minn.—New water mains are contemplated.

Aiken, Ga.—A water works system is contemplated.

Davis, Cal.—A water works system is contemplated.

Pine City, Minn.—A water works system is contemplated.

Decatur, Neb.—A water works system is contemplated.

Farmington, Minn.—A water works plant is contemplated.

Eureka, Mont.—A municipal water works plant is contemplated.

Norwalk, Wis.—A water works system is contemplated.

Sapulpa, Okla.—A filtration plant will be established.

Anadarko, Okla.—The water works system will be improved.

Twin Falls, Idaho.—A municipal water works system is contemplated.

Clifton, Colo.—The construction of a water works plant is contemplated.

Eau Claire, Wis.—Plans are being prepared for a concrete reservoir.

Hopkinton, Ia.—The extension of the water mains is contemplated.

Brandon, Ore.—Voted to issue bonds for constructing a water works system.

Masontown, Pa.—Voted to issue bonds for constructing a water works system.

Toulon, Ill.—Voted to issue bonds for constructing a water works system.

Prescott, Wis.—Will vote on the installation of a municipal water works system.

Camas, Wash.—Plans for constructing a gravity water system have been made.

Bowbells, N. D.—Voted to issue bonds for constructing a water works system.

Johnson, Neb.—The question of installing a water works system is being urged.

South Omaha, Neb.—The installation of a water works system is contemplated.

Pittsburg, Kans.—Voted to issue bonds for constructing a municipal water works plant.

Centralia, Ia.—Voted to issue bonds for the installation of an ample water supply.

Sioux City, Ia.—A turbine pump is to

be installed near Greenville in the near future.

Payson, Utah.—The estimated cost of installing a water works system is $42,000.

Fairmont, Minn.—Will vote on the issue of bonds for the improvement of the water system.

Murray, Utah.—Voted to issue $20,000 bonds for the improvement of the water work system.

Saginaw, Mich.—Will vote again on the proposition to install a municipal water works plant.

Hartselle, Ala.—Will vote soon on the issue of bonds for constructing a water works system.

Temple, Tex.—The water commission has decided to extend the water mains several miles.

Albert Lea, Minn.—An ordinance has been introduced in council to compel the use of water meters.

New Holland, Pa.—Will vote on the issue of $30,000 bonds for constructing a water works plant.

Cranford, N. J.—The question of establishing a municipal water supply will be voted on.

Denver, Colo.—Will vote Sept. 6 on issue of bonds for constructing a new municipal water plant.

Alliance, Neb.—Plans are being prepared for extensions to the water works and electric light plant.

Emporium, Pa.—Plans and specifications for extending the water works system will be made by H. B. Newton of Ridgeway.

Broken Bow, Neb.—Will vote Aug. 9 on the issue of bonds for the extension of the water works system.

East Dundee, Ill.—Voted to issue bonds for extending and improving the municipal water works system.

Jacksonville, Ore.—Will vote Aug. 1 on the issue of $30,000 bonds for establishing a gravity water system.

Charleston, S. C.—The question of establishing a municipal water and light plant will be investigated. Mayor Rhett.

Logan, Ia.—A new engine, pump and other machinery is to be installed to increase the water supply of this city.

Dillon, Mont.—Council has decided to put in an extra pipe line between this city and the reservoirs. Mayor White.

Parsons, Kas.—The construction of a reinforced concrete reservoir is contemplated. H. H. Parsons, genl. engr. Parsons Water Co.

Springfield, Ill.—The enlargement and improvement of the municipal water plant at a cost of $300,000 has been recommended.

Normal City, Ind.—The constructing of a municipal water works system is contemplated. Address R. Noftzger, atty. for town board.

Newark, O.—An ordinance has been introduced providing for an appropriation of $28,000 for the completion of the municipal water works plant.

La Crosse, Wis.—The construction of a new pumping plant at the La Crosse river in Levee Park has been recommended by the water committee.

Kansas City, Kas.—An ordinance has been passed providing for the issue of bonds for enlarging, improving and extending the water works system.

Oceanside, Cal.—The question of issuing bonds for improvements to the municipal water works system is being considered.

Anniston, Ala.—A 20-yr. contract with the Anniston Water Supply Co. became effective, after the defeat of the municipal ownership proposition, and one of the provisions of that company is that the main shall be extended to the 5th ward.

Louisville, Ky.—The Louisville Water Co. has decided to clean the two big reservoirs in Crescent Hill, and bids will be asked at once.

Springfield, Mo.—A petition has been submitted to city council asking for an appropriation of $550,000 for the construction of a municipal water plant.

Harrisburg, Ill.—The Saline County Light & Water Co. has been incorporated to construct, acquire, lease, maintain, extend and operate water works, electricity, etc.

Roslyn, L. I.—The new plans and specifications completed by W. E. Sexton, engr., based on the lines laid down by the State Water Commission have been approved. R. Tubby, water comr.

Jersey City, N. J.—The question of installing a device for the treatment of the water supplied to this city with bleaching powder was argued before Vice-Chancellor Stevens, July 20.

Coffeyville, Kas.—Will vote, Aug. 2, on the question of issuing $75,000 bonds for supplying this city with sheet or ground water for domestic and manufacturing purposes and for laying water mains and extending the present system.

CONTRACTS TO BE LET.

Gadsden, Ala.—Bids are asked until Aug. 4 for constructing a water works plant. W. T. Murphey, mayor.

Salem, O.—Bids are asked until Aug. 2 for constructing a water basin. C. R. Baker, dr. B. P. S.

Philip, S. D.—Bids are asked until Aug. 8 for constructing a water works system. A. S. Anderson, cy. audt.

Bird Island, Minn.—Bids are asked until Aug. 2 for extending a 4-in. water main. J. F. Cernan, vil. recdr.

Orleans, Neb.—Bids are asked until Aug. 5 for constructing a water works system. J. C. Gay, cy. clk.

Cherokee, Ia.—Bids are asked until Aug. 2 for sinking a well at the pumping station. Wm. Shardlow, cy. clk.

Wilson, Kas.—Bids are asked until Aug. 2 for constructing a water works and electric light plant. N. Coover, cy. clk.

White Hall, Ill.—Bids are asked until Aug. 5 for constructing a pumping station. Francis Fowler, mayor.

Euclid, Pa.—Sealed bids are asked until Aug. 22 for constructing a water main in Lawnview ave. Nelson J. Brewer, vil. clk.

Bridgeport, Okla.—Bids are asked until Aug. 15 for extending the water system and building a new power house. Cy. clk.

Edgemont, S. D.—Bids are asked until Aug. 10 for boring and piping an artesian well 2900 ft. deep. C. A. Hardy, cy. audt.

Washington, D. C.—Bids are asked until Aug. 15 for furnishing water meters and steel fillets. Gen'l purchasing agent, Isthmian Canal Comrs.

Keewatin, Minn.—Bids are asked until 8 p. m. Aug. 2 for 800 ft. of 6-in. river main, 2 hydrants and 2 cross ties. Geo. Oleson, vil. clk.

Attala, Ala.—Bids are asked until Aug. 4 for constructing a water works station, filters, machinery and extension of the system. Cy. coun.

Red Lake Falls, Minn.—Bids are asked until Aug. 5 for installing a pump, engine, air compressor, etc., in the court house. A. A. Latendresse, co. audt.

Cleveland Heights, O.—Bids are asked until Aug. 6 for constructing a 10-in. water main in Cedar road. H. H. Canfield, vil. clk., 307 Beckman Bldg., Cleveland.

Keeseville, N. Y.—Bids are asked until Aug. 25 for constructing 1 mi. of 10-in. c. i. water pipe, and a reservoir for a new source of water supply. J. B. Mace, prest, bd. water comrs.

Ft. Mason (San Francisco), Cal.—Bids are asked until Aug. 6 for constructing a reservoir, wooden tank, extending mains, etc., at Ft. Bang, Cal. Major Geo. McK. Williamson, Q. M., Ft. Mason.

CONTRACTS AWARDED.

Spooner, Wis.—Simpson & Stingle, of this city, secured the contract for the extension of the water mains.

Macomb, Ill.—The contract for constructing a water works plant has been awarded to the Pittsburg Filtration Co.

Colby, Kas.—The contract for constructing a water works system was awarded to F. C. Brooks & Son, of Jackson, Mich., for $55,000.

Grand Rapids, Mich.—Joseph Rusche was awarded a contract, July 7, for constructing a section of the filtration plant for $53,182.

Port Angeles, Wash.—The contract for supplying wooden pipe for the city water works system was awarded to W. W. Seymour of Tacoma.

Seattle, Wash.—The contract for constructing water mains in N. 73rd st. was awarded to the American Contracting Co., for $40,665.

Ft. Missoula, Mont.—The Des Moines Bridge & Iron Co., of Des Moines, was awarded a contract for a 3000-gal. field tank and trestle here, for $25,150.

Vale, Ore.—The American Light and Water Co., of Kansas City, Mo., has been awarded the contract for constructing a gravity water system, including auxiliary system.

Altus, Okla.—The contract for additional improvements to the city water works, light and sewer systems was awarded to the Maxcy Co., of Houston, Tex., for about $200,000.

Indianola, Ia.—The contract for laying 12,000 ft. of water mains, 15 Eddy hydrants and 17 Eddy gates, was awarded to the Des Moines Bridge & Iron Co., of Des Moines, for $7,000.

Montgomery, Ala.—The Hartley Boiler Works Co. was awarded the contract for building the river water standpipe for the new pumping station in North Montgomery, for about $10,000.

Atlantic City, N. J.—W. K. Mitchell & Co., of Philadelphia, was awarded a contract for installing steam and water pipes, valves and fittings at Absecon pumping station, for $7,450.

Philadelphia, Pa. — James Herbert Stitzer, Jr., 1201 Chestnut st., was awarded the contract for constructing a pump house, reservoir and storage tanks for the American Viscose Co., at Marous Hook.

Buffalo, N. Y.—Special.—A contract has been awarded to the Howard Iron Works for furnishing hydrants to this city for 1 yr., as follows: 6-in. hydrants, $47 each; 5-in., $44; 4-in., $41; 3-in., $32; 1½-in., $29.

Ft. Smith, Ark.—The Municipal Engineering and Construction Co., of Chattanooga, Tenn., submitted the lowest bid for laying water pipe and installing hydrants for the proposed water works extension. The cost will be about $75,000.

San Francisco, Cal.—The Keystone Construction Co., 18th and Clapp sts., was awarded a contract, July 6, for laying 17 mls. of pipe for the auxiliary salt water fire protective system in the district north of Market and east of Powell sts., for $129,000.

Andover, N. H.—Contracts for constructing water works were awarded, July 2, as follows: For pipe, to U. S. Cast Iron Pipe & Foundry Co., 71 Broadway, New York, at $24.70 per ton; hydrants and valves, to Fairbanks Co., $1,157, and pipe laying, etc., to Ablett & Bowes, Cohoes, N. Y.

BRIDGES.

Cleveland, O.—This city voted to issue $2,000,000 bonds to abolish grade crossings.

Carthage, Mo.—Bids are asked until Aug. 3 for building 6 county bridges. Wm. Kohlman, co. engr.

Danville, Ill.—Bids are asked until Aug. 2 for constructing 7 bridges. W. H. Nichols, co. audt.

Ft. Dodge, Ia.—Bids are asked until August 27 for constructing the 3rd st. viaduct. W. L. Tanke, cy. clk.

Laporte, Ind.—Bids are asked until Aug. 4 for constructing several bridges. Chas. Griswold, co. audt.

Martinsville, Ind.—Bids are asked until Aug. 2 for constructing 3 bridges. B. E. Thornburgh, co. audt.

Muncie, Ind.—Bids are asked until Aug. 3 for constructing 3 reinforced concrete arches. H. V. Moore, co. engr.

Paoli, Ind.—Bids are asked until Aug. 2 for constructing a bridge at Johnson's Ford. A. B. Ham, co. audt.

Wabash, Ind.—Bids are asked until Aug. 3 for constructing certain bridges. J. P. Noftzger, co. audt.

Brownstown, Ind.—Bids are asked until Aug. 2 for constructing 7 bridges. H. W. Wacker, co. audt.

Lima, O.—Bids are asked until Aug. 2 for constructing a bridge over Hog Creek. C. R. Phillips, co. clk.

Okwomah, Okla.—Bids are asked until Aug. 8 for constructing 25 steel and wooden bridges. E. Stine, cy. clk.

Sylvania, O.—Bids are asked until Aug. 2 for constructing a bridge. Chas. J. Sauzenbacher, co. audt.

Ft. Dodge, Ia.—Bids are asked until Aug. 22 for constructing a metal viaduct. S. J. Bennett, engr.

Brazil, Ind.—Bids are asked until Aug. 2 for constructing a steel bridge with concrete abutments. J. L. Burns, co. audt.

Fowler, Ind.—Bids are asked until Aug. 8 for constructing a bridge over Mud Pine Creek at Chase. Lemuel Shipman, co. audt.

Corydon, Ind.—Bids are asked until Aug. 2 for the repair of a bridge over Big Indian Creek. Wm. Taylor, co. audt.

Cleveland, O.—Bids are asked until Aug. 10 for constructing bridge work. John F. Goldenbogen, clk. co. comrs.

Sandusky, O.—Bids are asked until Aug. 10 for constructing a highway bascule bridge and approaches in Huron. John Dast, co. audt.

Gaffney, S. C.—Bids are asked until Sept. 5 for rebuilding steel approaches on concrete base, repair bridge, etc. E. Felix, co. supr.

Bridgeton, N. J.—Bids are asked until 2 p. m. Aug. 2 for building an arch bridge over Burnt Mill Stream; 10-ft.

addition to bridge at Black Water Stream. Walter M. Sharp, co. engr.

Oswego, N. Y.—Bids are asked until Aug. 2 for constructing a joint city and county bridge over the river at Bridge st. John Smith, comr. pub. wks.

Anderson, Ind.—Bids are asked until Aug. 16 for constructing 5 reinforced concrete and steel bridges near this city. A. Smith, co. engr.

New Castle, Ind.—The county council has appropriated $1250 for the construction of a bridge over Flat Rock, and bids will be asked soon.

Champlain, N. Y.—Bids are asked until 2 p. m. Aug. 3 for constructing abutments for the Cooperville highway bridge. Wm. Broder, town clk.

Shelbyville, Ind.—Bids are asked until Aug. 3 for constructing a bridge on Hancock-Shelby county line. G. B. Huntington, co. audt., Shelby co.

Des Moines, Ia.—Bids are asked until Aug. 10 for constructing 6 reinforced concrete bridges across Des Moines river at Walnut st. Mayor Hanna.

Wilmington, N. C.—Bids are asked until Aug. 16 for constructing a superstructure of a steel highway bridge over the railroad tracks at 6th st. C. R. Humphreys, cy. engr.

Ottawa, Ont.—Bids are asked until Sept. 1 for constructing the superstructure of a bridge across the St. Lawrence river, near Quebec. L. K. Jones, secy. dept. rys. & canals.

STREET LIGHTING.

Pueblo, Cal.—Voted to issue bonds for installing an electric light and power plant.

Cleveland, Tenn.—An electric light franchise has been granted to the Union Improvement Co.

Greenville, S. C.—The Home Lighting Co. has been granted a 30-yr. franchise for electric lighting.

Pocahontas, Ia.—Bids will be asked soon for constructing an electric plant. Geo. Schneider, cy. clk.

Wilson, Kas.—Bids are asked until Aug. 2 for constructing an electric light and water plant. N. Coover, cy. clk.

Hudson, O.—Plans for constructing a municipal electric light plant have been prepared and contracts will be let soon.

Ft. Morgan, Ala.—A contract for installing an electric light system here was awarded to the Babcock & Wilcox Co. of New Orleans, for $6994.

Muncie, Ind.—The Redkey Electric Co. has been incorporated to manufacture and sell electric current, by D. E. Breed, H. L. Finley and G. B. Ball.

Evergreen Park, Ill.—Bids are asked until Aug. 6 for constructing and installing poles, wires and globes for about 22 lamps. L. H. Weber, vil. clk.

Taylor, Tex.—A franchise has been granted to E. R. Schultz, of Alamagorda, N. Mex., for laying pipe and installing a plant for a gas plant.

Cleveland, O.—Bids are asked until Aug. 24 for electric current for lighting and power, and steam for heating. John F. Goldenbogen, clk. co. comrs.

Paullina, Ia.—The contract for constructing a municipal electric light plant was awarded to the Interstate Supply Co., of Sioux City, Ia., for $11,500.

Atlanta, Ga.—The citizens are considering the installation of a permanent ornamental electric lighting system for the main streets of this city. Forrest Adair is interested.

Boston, Mass.—Bids are asked until Aug. 4 for metallic filament lamps, as follows: 5435 25-watt, clear; 202 40-watt, frosted; 50 60-watt, frosted; 3 100-watt, frosted. Wm. J. Porter, audt. school com.

Crawfordsville, Ind. — Contracts for equipment for the new electric light plant have been awarded as follows: Generators and exciters, Ft. Wayne Electric Co., $21,715; 200 arc lamps, Westinghouse Electric Mfg. Co., $11,300.

Buffalo, N. Y.—Special.—This city contemplates installing 2 steam turbine generators of 5000 kw. capacity for the purpose of generating electric current to supply the requirements of the city in its different buildings and streets.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Natchez, Miss.—Bids are asked until Aug. 3 for sprinkling streets. W. G. Benbrook, mayor.

Butte, Mont.—This city contemplates erecting an incinerator at a cost of $50,000.

Washington, D. C.—It is probable that oil may be substituted for water in sprinkling the roads of the district.

Kansas City, Mo.—W. C. Weaver, supt. street cleaning, submitted a proposition to the board of public works, July 23, to purchase 2 motor trucks to replace the 16 horse carts that now follow the street sweepers.

PARKS.

20 acres is contemplated on the west side.

Fall River, Mass.—The board of aldermen have adopted a park loan of $50,000.

Grand Rapids, Mich.—This city is being urged by the citizens to issue bonds for acquiring new parks.

FIRE APPARATUS.

Beach, N. D.—This city has decided to purchase 2 chemical engines.

Appleton, Wis.—The purchase of a fire engine is contemplated. Mayor Canavan.

Baltimore, Md.—The purchase of an automobile fire engine is contemplated for the Alert Volunteer Fire Co.

Santa Barbara, Cal.—Bids are asked until Aug. 9 for a motor propelled combination chemical and hose wagon. Alfred Davis, clk. bd. fire comrs.

Louisville, Ky.—The Commercial Club of Jeffersontown will secure a modern fire department and fire apparatus.

New Orleans, La.—Plans for a new engine house at Carrollton ave. and Mess st. have been completed and when built, a hook and ladder truck and chemical engine will be installed.

Buffalo, N. Y.—Special.—The common council has ordered the construction of a fire engine house to be located at Amherst and East sts.; engine house at Clinton st. and Bailey ave.; fire truck house at Amherst and Grant sts. The commissioner of public works will prepare plans and get bids.